RIG

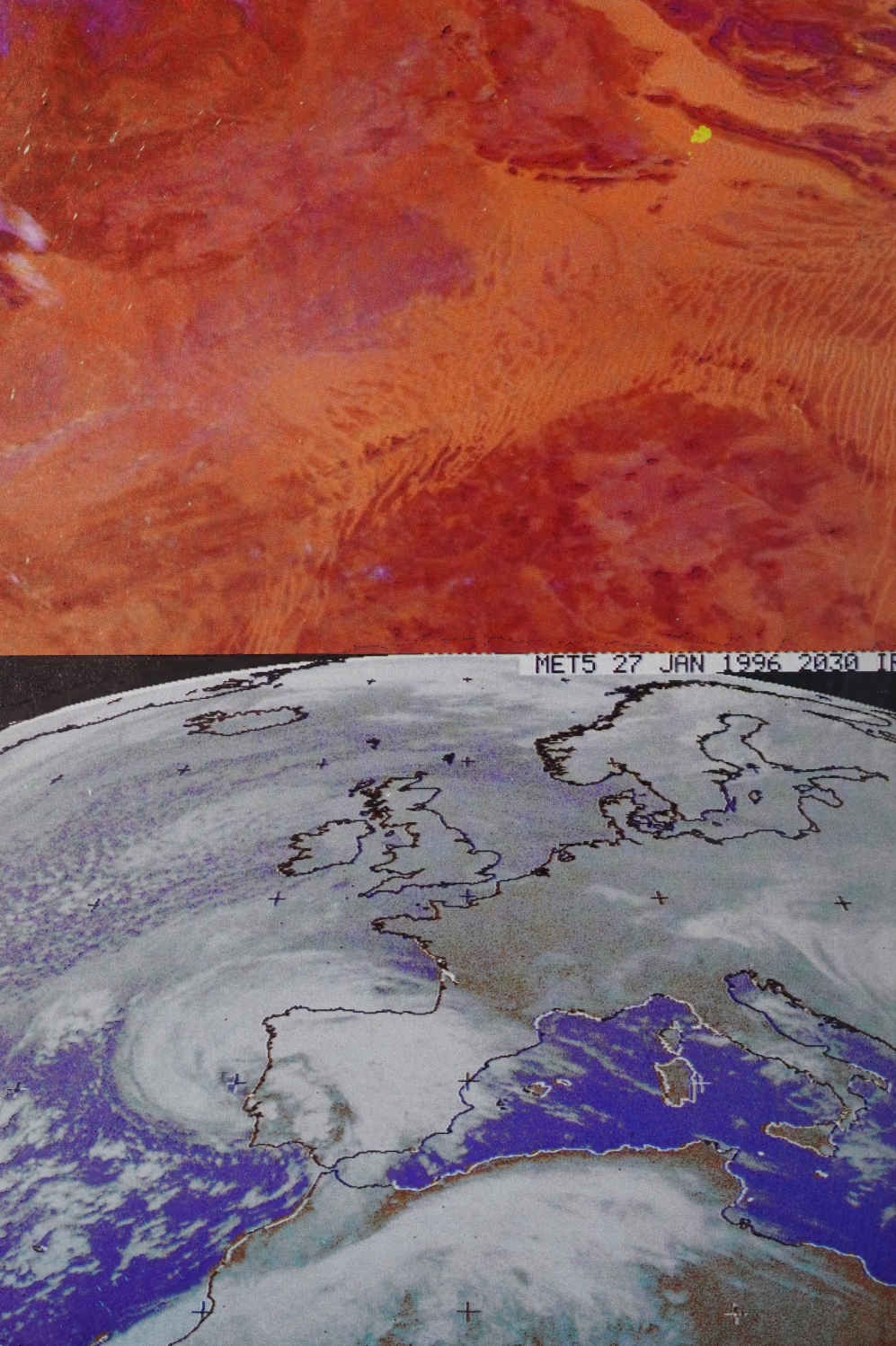
Remote Imaging Group

JOURNAL

Issue Number

44

March '96


MET5 27 JAN 1996 2030

CONTENTS MARCH 1996

Officers 1995		2
Chairman's report	Frank Bell	3
From the Editor's desk	Peter Wakelin	4
Treasurer's report	Mark Clarke	5
RIG annual conference	Frank Bell	8
Features:		
A portable/collapsible quadrafilar helix antenna	Chris van Lint	10
Contrast enhancement unit	Sam Elsdon	14
A passage over India	Frank Bell	28
Remote imaging, remotely (again)	David Banks	32
The millennium satellite	Frank Bell	33
RIG *sat* IF1 - synchronous JVFAX interface	Godden & Taylor	34
FAXCONV: A really small WX-SAT program	John Boyer	37
Variation on a theme. An alternative use for the RIG *sat* IF1	Bryan Taylor	40
A beginners' guide to using JVFAX	Les Hamilton	43
Attention Lindenblad users	John Tuke	48
Real (MSF) time	Bryan Taylor	49
Interpreting weather satellite imagery - part 13	Peter Wakelin	50
Re: knots in the sky		54
Galileo update		58
Regulars:		
RIG at rallies		9
World weather highlights		59
Internet news		60
Members' letters		62
Shareware corner	Les Hamilton	64
Orbiting update, all the latest news	Peter Wakelin	70
Kepler elements		75
RIG GIF library	Peter Wakelin	76
RIG helplines		78
RIG subscriptions		79
RIG shop corner		80
Description of cover images		83

CHAIRMAN	Frank Bell Coturnix House, Rake Lane, Milford, Godalming, Surrey. GU8 5AB. Tel: 01483 416897
VICE CHAIRMAN	Sam Elsdon 22 The Swallows, Welwyn Garden City, Hertfordshire, AL7 1BY. Tel: 01707 320851
SECRETARY	John Tellick 34 Ellerton Road, Surbiton, Surrey, KT6 7TX Tel: 0181 390 3315
MEMBERSHIP SECRETARY	All membership enquiries Ray Godden, G4GCE Wayfield Cottage, The Clump, Chorleywood, Herts. WD3 4BG. Tel: / FAX: 01923 720714 Email 101602.376@compuserve.com
TREASURER	Mark Clarke, G3CQL 9 Park Lane, Bulmer Tye, Sudbury, Suffolk, CO10 7EQ Tel: 01787 374128 (7pm-9pm) Fax: 01787 883141
JOURNAL EDITOR	Peter Wakelin, Email: peter@ascotrig.demon.co.uk 1 Charters Road, Ascot, Berks. SL5 9QF Tel: 01344 23200 Fax: 01344 26028
MAKE-UP EDITOR	Mark Pepper 9 Hornbeam Close, Heath Park, Camberley, Surrey, GU15 4UE Tel: 01344 777730 (8:00pm - 9:00pm)
ADVERTISING MANAGER	Michael Gill, G6HOM 3 Turnbridge Close, Cutbush Grange, Lower Earley, Reading RG6 4UZ. Tel: 01734 869818
COMMITTEE	Henry Neale, Les Currington
RIG BBS	Tel 01945 440666 (300Bd to V42 MNP2-4 & V42bis MNP5)

Published by The Remote Imaging Group (RIG). VAT Registration No. 594 7483 83
Printed by Pinnacle Design, Print and Marketing Limited, Swindon.

CHAIRMAN'S REPORT

FRANK BELL

Several of the issues that I would like to report to members appear elsewhere in this journal so I will not duplicate the information, except to point out that progress has been made towards making the Millennium Satellite a reality and the decision which has been taken to hold this year's Conference and AGM in Chester on 27 April 1996.

I expect that many members will have received the notice from NOAA about their Fourth International Satellite Direct Broadcast Services Symposium which will be about their polar-orbiting satellites, POES. Brief details also appear in this journal. It is to be held in Annapolis, Maryland, USA on 10th, 11th and 12th of June. The published programme looks very interesting, not only for what NOAA is currently doing and the application of this work, but also for information on future plans. The cost for the three days is $170, which is expensive but bearable. Transport and accomodation costs must be added, which puts it out of reach of many of us. However, any members planning to go are invited to contact me and I will co-ordinate the group if necessary. If you cannot aford to go, then spend £10 and support the RIG conference in Chester!

Your committee have been busy dealing with the affairs of the Group and I would like to thank them for the dedication and hard work they put into running it. With over 2000 members, keeping track of them all, membership renewals and new subscriptions, correspondence, sales, rallies and technical projects, requires time and commitment on the part of those involved.

We are continuing to develop Group projects. The astonishing success of the RX1 receiver has led to the follow-on upgrade to the five-channel model. Three hundred PCBs were sold for the RX1 project and a final batch of 30 is being produced to use up the few remaining crystal filters. The project for a computer synchronous interface board, which will operate with JVFAX, is well underway and orders for the PCB can now be placed. JVFAX is an excellent programme, although it can be frustrating to use because of its complexity. There are colourful overlays and the colour animations that can be generated are stunning. With JVFAX70 software available free of charge, a RIG RX1 and the new synchronous interface, I believe it is possible to be into satellite reception for well under £100 but, of course, you do have to build the kits.

Your committee look forward to meeting members at rallies and also at the Conference and AGM in April. Remember that RIG belongs to you and we are always looking for new blood on the committee and help at rallies.

FROM THE EDITOR'S DESK

PETER WAKELIN

At about this time last year we reported that one of the shareware tracking programmes used by some of our members failed to work properly after 1 January, then in October we heard that another could not cope with double-digit months. Now, we hear that 'Satellit' fails to predict correctly in 1996. These problems are not caused by minor 'bugs' but by sloppy programming. If the simple checks required to detect these problems have not been made, then one can have little confidence in the handling of the complex mathematics involved.

Many tracking programmes have been mentioned in these pages over the years but, as far as I can recall, the accuracy of the predictions has never been questioned. For someone with time on their hands, it could prove to be a valuable exercise to do a comparison between the programmes in common use. A typical weather satellite orbit is probably unsuitable for test purposes. One with a larger eccentricity and a perigee around 300km is more likely to reveal weaknesses over a shorter prediction run.

During a few idle moments recently, I travelled forward in time and ran predictions for January 2000 using fictitious elements in several different programmes. They all failed. With less than four years to go, I hope these problems are going to be addressed in good time. Is this potentially serious problem confined to shareware writers, I wonder? Have professional programmers got the situation under control? Are any of our favourite satellites going to have problems with ephemerides after 1999 and switch to 'safe-mode' just after 2359 on 31 December? Or, worse still, go belly-up and try to image the Sun? Impossible, I hear you say, but I recall that, not so long ago, a rather expensive telescope was sent into orbit with an inadequately tested primary mirror.

That aforementioned telescope had its defective optics corrected during a later Shuttle mission and the Hubble Space Telescope is producing some truly remarkable imagery. The back cover of this issue shows one such image. It shows by far the remotest objects ever to appear in this journal, or any other journal. The corrective optics clearly did their stuff but it is the precision pointing ability of the telescope that I find difficult to comprehend. This massive instrument, which is hurtling around the world at some 18,000 miles an hour, going from hot sunlight to cold darkness and back every orbit, can point to the same tiny spot in space continuously for up to forty minutes at a time to achieve these incredibly sharp images. Is there any limit to Man's ingenuity? ⊕

TREASURER'S REPORT
Mark Clarke

Income and Expenditure Account Year Ended 31 December 1994

	31.12.94		31.12.93	
	£	£	£	£
Income:				
Sales	46,226		64,548	
Subscriptions	25,425		10,305	
Advertising	-		1,058	
Donations	78		60	
Conference Income	-		6,208	
		71,729		82,179
Cost of sales:				
Opening stock	11,479		8,549	
Purchases	41,618		57,716	
	53,097		66,265	
Closing stock	(17,241)		(11,479)	
		35,856		54,786
GROSS PROFIT		35,873		27,393
Other income:				
Deposit account interest		238		288
		36,111		27,681
Expenditure:				
Management Charge	955		1,537	
Newsletter Printing	10,733		8,845	
Conference Expense	-		9,477	
Telephone	689		1,350	
Post & stationery	6,152		6,297	
Advertising	1,051		240	
Travelling	1,006		143	
Subscription	14		14	
Licences & insurance	500		500	
Software	152		227	
Repairs & renewals	40		585	
Sundry expenses	522		375	
Accountancy	600		325	
Promotion & exhibitions	-		472	
		22,414		30,387
		13,697		(2,706)
Finance costs:				
Bank charges	1,221		1,417	
Corporation Tax	72		72	
		1,293		1,489
Carried forward		12,404		(4,195)

Trading and Profit and Loss Account for the Year Ended 31 December 1994

	31.12.94		31.12.93	
	£	£	£	£
Brought forward		12,404		(4,195)
Depreciation:				
Computer equipment		1,203		1,622
SURPLUS FOR THE YEAR		£11,201		£(5,817)

Balance Sheet 31 December 1994

	31.12.94		31.12.93	
	£	£	£	£
FIXED ASSETS:				
Computer equipment		2,366		3,244
CURRENT ASSETS:				
Stock	17,241		11,479	
Trade debtors	35		1,027	
Bank account no. 1	2,843		7,911	
Bank account no. 2	13,434		-	
Bank account no. 3	10		-	
Cash in hand	-		1,101	
	33,563		21,518	
CURRENT LIABILITIES:				
V.A.T.	614		-	
Trade creditors	600		1,554	
Taxation	72		72	
	1,286		1,626	
		32,277		19,892
		£34,643		£23,136
FINANCED BY:				
CAPITAL ACCOUNT:				
Balance brought forward	23,442		28,953	
Add:				
Surplus	11,201		-	
	34,643		28,953	
Less:				
Deficit	-		5,817	
		34,643		23,136
		£34,643		£23,136

Tangible Fixed Assets Schedule 31 December 1994

	Computer Equipment £
Cost of Valuation:	
At 1 January 1994	4,866
Additions	325
Surplus on revaluation	3,882
At 31 December 1994	9,073
Depreciation:	
At 1 January 1994	1,622
Charge for year	1,203
Revaluation adjustment	3,882
At 31 December 1994	6,707
Net Book Value:	
At 31 December 1994	2,366
At 31 December 1993	3,244

The accounts which, this year, have been audited by Casson & Beckman in Colchester, show an increase in income from subscriptions but a decrease from sales following a change in the Group's policy on resale of equipment. Certain expenditure items have increased, particularly where we have been using professional services.

Savings planned in 1995 will be reflected in postage following a move to contract mailing of the journal and a change in the type of bank account will relieve us of bank charges. Our balance sheet shows a very healthy position for the future of the Group. 1995's audit is now underway and should be available at our AGM in April and published in RIG45.

With the Group's continuing expansion we shall be giving serious consideration to changing our status to "Limited by Guarantee". This subject will be fully discussed with the membership once the committee have appraised the subject.

In RIG43 Frank Bell issued a plea for a new treasurer but, alas, to no avail. I am now entering my 5th year as treasurer and with a career change imminent I now need to retire from this post. Any group like ours with an annual turnover in excess of £60,000 does require someone with some accounting knowledge and also an understanding of VAT procedures. 4-6 hours a week and a Saturday afternoon every six weeks or so for a committee meeting is the level of commitment we require. I will be very pleased to hear from anyone interested in taking on this rewarding role who could work with our dedicated team of committee members. For more deatils, drop me a line or ring me on 01787 374128. Please consider helping if you are at all able - the situation is becoming quite desperate.

RIG ANNUAL CONFERENCE

Frank Bell

The returns from the questionnaire associated with membership renewal have been analysed by Ray Godden, our membership secretary. One of the questions related to the location of the Annual Conference. The returns have indicated that there is a strong preference for a one day conference like we had last year and the favoured venue is the Midlands rather than the South East. In view of an offer we have received, your committee have decided on Chester College of Further Education for the Conference and AGM for 1996. The date is Saturday 27 April 1996. An exhibition is planned with all the major manufacturers and suppliers you would expect, being invited to display their standard products together with their latest offerings. Doors will open at 9.00 am. There will be lectures and presentations during the day, as well as the opportunity to circulate in the exhibition area. The cost to RIG members will, as usual, be kept to a minimum; the target is not to exceed £10 per delegate.

The RIG AGM will be held at 4.00 pm at the same location. As well as including the formal business of the AGM, this will provide an excellent opportunity for members to express their views on any aspect of the Group's activities in an open discussion session toward the end of the meeting.

I am sure you will recall the success of the previous conferences that RIG have organised, with excellent exhibition areas and interesting talks. However, I wish to remind you that the ultimate success of such events depends on the membership turning up in sufficient numbers so that exhibitors, lecturers and your committee feel that the considerable effort that goes into organising such an event, makes it worthwhile.

There is a flyer enclosed with this issue of the RIG Journal which gives up-to-date details of the Conference and AGM together with a delegate registration form. An interesting and informative day is guaranteed and you are urged to come if you can. It is worth noting that Chester, the Roman Castra Devana (the camp on the Dee), is a very interesting city. Situated on the right bank of the River Dee, 7 miles from the estuary, it is one of the principle 'gates' to North Wales. With its well-preserved walls, famous 'rows', timber houses, and fine cathederal, it is one of the most medieval-looking towns in England. I will be spending the whole weekend there with my wife; devoting Saturday to the conference and Sunday to social and recreational activities.

This is the formal notice that the RIG AGM will take place at 4.00 pm on Saturday 27 April 1996 at Chester College of Further Education and will be open to all RIG members without charge. ⊕

MEMBERS' ADVERTISEMENTS

Members may advertise surplus equipment etc. for sale in the journal free of charge but subject to space being available. Advertisements should be concise and must pertain to RIG activities. They should be submitted to the journal editor and not the advertising manager.

FOR SALE. Decade thumb wheel switches (RS 338-383) appr 30 available. Ideal for Blue LED Driver (Sep '95 issue), £1 ea incl p&p. Matthew Ambler 01422 201926 (eves.)

FOR SALE. Amiga A500 computer. Including memory upgrade to 1Mb, real time clock, second disk drive, Amiga colour monitor with sound, modem, two mice and two joysticks, lots of radio related and other software, all handbooks and software reference manuals. Offers around £185. Andy Hewat, Guildford, 01483 34954.

FOR SALE. Complete Timestep HRPT system; dish to decoder working system, dish includes sat TV feed/polariser/LNB. £700. Timestep PROsat II card and software including Track II and colour animate options £60. Meteosat 36 ele loop Yagi £25. Adrian G4JBH 0585 952868 or 01935 23873.

WANTED. 1.7GHz loop Yagi and Meteosat downconverter. Malc Taylor 01623 640605 or write to 56 Newgate Lane Mansfield NG18 2LQ.

WANTED. OKI MSM5525RS1.0 for Timestep DF04 frequency meter kit (or complete kit). FO77 miniature frequency meter module or similar. Graham Smith (GIJVZ) 01623 662862

RIG AT RALLIES

RIG will be at the following Rallies this year:

Picketts Lock	9, 10 March
Elvaston Castle	9 June
Longleat	30 June
BARTG, Sandown	15 September
Leicester	18, 19 October

Plus, of course, the Conference/AGM at Chester on 27 April. ⊕

A PORTABLE/COLLAPSIBLE QUADRAFILAR HELIX ANTENNA FOR THE 137 MHZ APT BAND

Chris van Lint

Background

In the past, many articles have appeared in a number of publications singing the praises of Quadrafilar Helix (QFH for short) antennas. Those of us who have had an opportunity to try such an antenna will agree that this device appears to be optimum for APT, since it is truly circularly polarised, with more gain as compared to the classical Turnstile or Lindenblad types. Often these articles are accompanied by construction details to allow the home constructor to build a suitable device themselves. The majority of these articles, however, employ an infinite balun matching scheme, which is not exactly constructor friendly to the average home experimenter. These antennas rely on using copper tubing filars together with a hard-line co-ax filar to form the balun. In some locations hard-line co-ax is difficult to obtain and expensive. QFH antennas using this construction method require that the filars are insulated from the support and often PVC piping is used for this purpose. Since the filars have to be shaped into the desired helix form, they have to be self supporting and some means of anchoring them to the support mast has to be devised. This is not an easy feat in addition to which the shaping of 1/4 inch tubing is not as simple as it seems. The interconnection of the filars has to be done carefully or the antenna will not work. Construction details which I have seen so far are rather confusing and they have put me off building a QFH of the infinite matching balun type. There are, of course, alternative matching schemes available and a vast improvement as far as the home constructor is concerned is the Slotted or Volute QFH. Such an antenna was described by Mark Pepper in RIG journal number 37; the most difficult part possibly being the slotting of the outer tube. Construction of this antenna, however, does assume that certain components, such as the end cap and 1/4inch copper tubing are readily available. Also the soldering of individual filars to the tube requires heavy duty soldering equipment, ideally a torch and again the shaping of the filars needs some practice. Notwithstanding these arguably minor problems I had no difficulty building two of these Volutes and both are performing well.

Ever since arriving in Hongkong I have been plagued by pager interference. Being a Crown Colony (at least until end June 1997) Hongkong uses the 137-138MHz frequency bands for paging applications as well as various others. In fact there is a pager transmission on 137.95MHz, the same frequency as Mercury Communications uses in the UK. This has made reception of certain APT frequencies misery and I can not get acceptable results on the 137.50 and 137.85 transmissions. After having tried numerous ideas to overcome the problem, including narrow band-pass filtering, I have decided that the only practical solution is to change location. This is of course easier said than done. It is not practical to relocate from my present abode for a number a reasons, not the least of which is the fact that any other residential area

will not necessarily offer relief from the interference. The only areas where one could expect to get interference-free reception would be the more remote and less populated areas on the south eastern part of Hongkong Island and this would require some form of mobile set-up. Having convinced myself that the best possible APT antenna must be the QFH, I set my sights on constructing a portable version.

Description

I claim no originality for the antenna I am about to describe. As mentioned before there are numerous descriptions in circulation at the moment. A fundamental deviation from classical QFH antennas is the fact that in this design the filars are not supported directly by the mast but by PVC arms. This relatively simple but nevertheless brilliant idea came from Eugene (Buck) W3KH, who also provided the dimensions. My contribution lies in the idea of using removable arms and conventional flexible co-axial cable for the filars and matching line alike, which allows the filars to be folded against the support mast when not in use.

In contrast to the 3/4 turn Volute alluded to earlier, this antenna is a 1/2 turn, half wavelength device using a self-phasing big/small loop configuration. Impedance matching is achieved by an infinite balun arrangement in which one of the four elements is a length of coax to produce a characteristic impedance of approximately 40 Ohms. The antenna is constructed from standard 20mm PVC electrical conduit tubing for the support arms and a length of 32mm PVC tube for the support mast. To accommodate the support arms I used 6 PVC 2-way junction boxes. The relevant dimensions can be noted from figure 1 (see inside back cover). The dimensions for individual arms are always 1/2 of the total width when measured from the centre of the support mast. QFH antennas of this type use a Big and a Small loop and this is the reason why instead of 4 way, two 2 way junction boxes were used, mounted at 90° one above the other. This procedure creates a (B)ig and (S)mall loop. Each loop splits into 2 filars, which are supported by removable PVC arms B1, B2, S1 and S2. Figure 2 (see inside back cover) shows the connection of the filars in relation to each other. Note that the smaller loop is not connected at the bottom and for this reason filars S1 and S2 may be left joined so that only one length of coaxial cable of 221.6mm is used. The diagram shows connection details as viewed from the top of the mast, connections at the bottom and the joining of the feed cable. Only one half or filar of the big loop is used as a coaxial conductor and those filars which do not require use as a coaxial cable have the centre conductors soldered to the braid at both ends. I used RG-6U coaxial cable, not because of its low loss, which is not particularly relevant at these frequencies, but because it has a continuous aluminium shield in addition to the braid, which gives the cable extra rigidity which is useful for shaping the filars once the arms are fitted. Since the APT satellites in which we are interested transmit their signals using right hand circular polarisation (RHCP), the filars must be wound in an anti-clockwise direction, when viewing the antenna from the top down along its vertical axis.

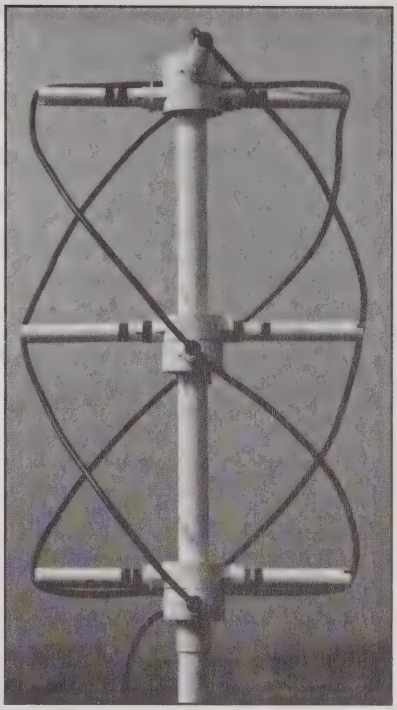
Construction

Start by cutting a suitable length of support mast. In my case I cut the mast just long enough to allow a socket to be fitted inside the lowest 2-way junction box, to allow the mast to be extended by inserting another length of 32 mm pipe. Cut holes in the bottoms of the junction boxes. The 2 junction boxes are cemented together at a 90° offset angle to form a cross and a total of 3 sets of assemblies are required. Slide the centre assembly onto the mast, followed by the top and bottom ones. For the centre assmbly, a suitable hole may be cut in one of the junction box lids which is slid over the mast to cover the centre assembly. Note that no dimensions are given for positioning the centre assembly, as this is not critical and should simply be in the centre. Cement them into place initially with solvent based PVC cement. I find that this adhesive once a little dry allows some level of adjustment before it is completely sets. Once you are satisfied that the assemblies are correctly aligned and the adhesive is dry, apply generous amounts of an epoxy based adhesive to complete the mast assembly. Now cut the support arms. The actual length will depend on the physical dimensions of the junction boxes used. Make sure that you adjust the final length on the basis of the arms having been tightly fitted into the junction box sockets. Remember that the loop dimensions shown in figure 1 constitute the total width of each of the two loops and the width of the corresponding arms should therefore be half and measured from the centre of the mast. Allow a little extra length to accommodate 2 slots in the support arms in which the coaxial cable filars can be snugly pressed into place.

Each junction box assembly will have one pair of short and one pair of long support arms. Drill holes big enough to accommodate the coaxial cable on top of and as close as possible to the top arms. For the bottom arms do the same, but below the arms. Once completed, insert and twist the arms so that the slot slopes from top left down 45° to bottom right. The arms may now be removed and put aside. It may be helpful to put marks on the sockets and arms to indicate in which position the 45° angle is achieved. If the marks on both the sockets and arms are in exactly the same position there should be no need to put identifying marks on individual arms and sockets. i.e. the position marks should be sufficient. Insert the coaxial cable which forms the smaller loop into the hole below one of the short arms all the way so that the cable exits on the opposite side. Ensure that the length of cable at both sides is the same. Join the centre conductors with the braid. Cut two equal lengths of coax which will form the big loop. On one piece only join the inner conductor to the braid and insert one end in the hole above one of the longer arms. Do the same with the coaxial cable left over in the opposite hole. Solder the 4 cables in the top junction box according to the instructions in Figure 2. Insert the other ends of the coaxial cables in the holes situated 1/2 turn anti-clockwise on the bottom assembly.

Drill a suitable hole somewhere in the lowest junction box to accommodate the coaxial feed line which has been provided with a connector of your choice at the other

end. Push the feed line through and join all cables as shown in Figure 2. Cement the top junction box cover and the cover for the bottom junction box assembly into place. Now insert the arms in their correct positions and adjust the slot angles, simply press the coaxial filars into the appropriate slots, moving anticlockwise from the top, completing a half turn by the time you get to the bottom. A little manual shaping of the filars to form the helical shapes and the antenna is finished. If the antenna is to be used as a permanent fixture rather than a mobile device you can drill a small hole through the arms, behind the slots at 90° to accommodate a nylon tie to secure the filars into the slots.



Performance

I have compared the performance of my prototype against my other QFH antennas, including a commercial version under dynamic conditions, using a coaxial relay to switch from one antenna to the other. I am convinced that the performance of the portable QFH is a good as my other QFH antennas. There are no noticeable 'holes' and I get usable signals from AOS to LOS (on 137.62Mhz which is the only frequency I can receive without interference!). If you are plagued by interference from a single source, you may find the QFH more suitable than other types of antennas. The QFH produces a higher magnitude of gain on circularily polarised signals as compared to linearly polarised signals. This in effect attenuates linearly radiated signals in relation to the circular ones and reduces interference.

During field testing I noticed that the QFH appears to have distinct directivity in relation to linearly polarised signals. In my case there is a pager transmitter, which makes reception of signals on 137.5MHz almost impossible. This interference is not intermodulation and it is there when no signal is being received from the satellite. I found that by turning the antenna when not receiving a satellite signal, it was possible to find a very distinct reduction or sometimes a "null" in the strength of the interfering signal. This has enabled me, for the first time, to decode NOAA 12 signals on 137.50MHz. A similar improvement could be obtained when dealing with other forms of linearly polarised interference. ⊕

CONTRAST ENHANCEMENT UNIT

Sam Elsdon

Introduction

This article describes a unit which permits real time contrast enhancement of APT visible and/or IR, WEFAX and Meteor images. It was designed mainly to overcome the tendency of visible APT images to be somewhat darker than the associated infrared (IR) image, particularly during winter months.

The unit is presented as a series of modules from which constructors can select those suitable for their own needs. The block diagram shows how the modules were connected in the prototype and the signal names relate to the input and output points on the respective diagrams.

General Principles

Since the whitest part of an APT image usually occurs in the IR segment, adjustment of the display hardware for peak white will result in a well balanced IR image. Under non-optimum illumination, the visible image will probably contain, at best, light grey for the high clouds. Even under optimum illumination, ground detail in the visible image may be darker than desired and adjusting the system gain to compensate will result in a 'bleached' IR image. Therefore, a method is required where only the visible image is amplified, leaving the IR image untouched.

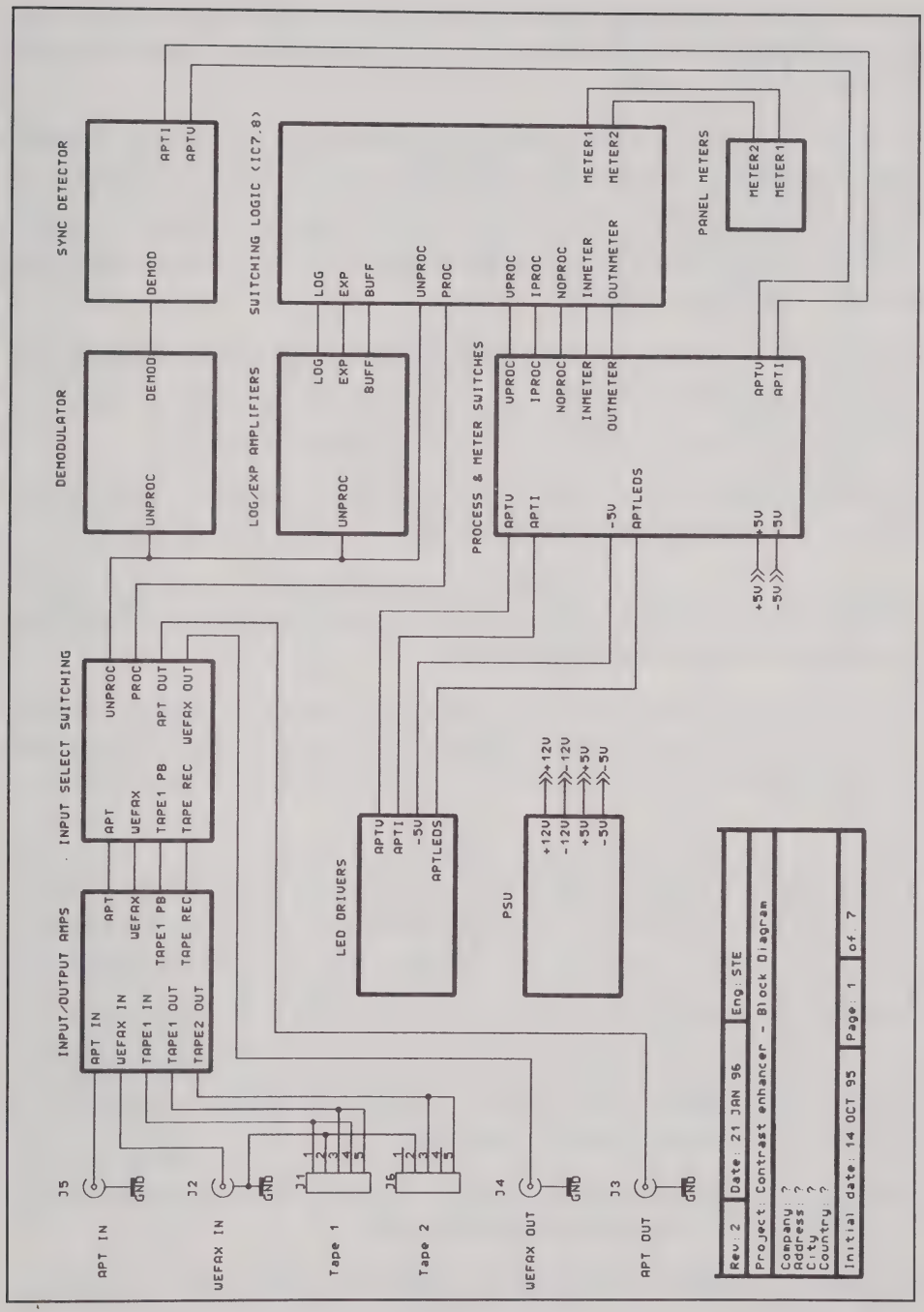
Assuming that signals can be derived to control which part of the image will be amplified, linear amplification may improve ground detail but may render the clouds too bright. An amplifier with a logarithmic characteristic will apply more gain to low level (dark) signals than to high level (bright) signals. This compresses the signals into a smaller band towards the bright end of the signal range, improving ground detail without bleaching the clouds.

Conversely, an evening/night-time IR image will contain signals which are grouped at the bright (cold) end of the range, producing a low contrast, bright image. An exponential amplifier will expand the contrast range making the dark (warm) parts more pronounced.

Circuit Description

1. Signal Path

All inputs are brought to a common level using input amplifiers, U1. The circuit should be replicated for each signal source using quad op-amps to conserve space.


SYNC DETECTOR
DEMOD
APTI
APTV
DEMODULATOR
UNPROC
DEMOD
SWITCHING LOGIC (IC7,8)
LOG
EXP
BUFF
UNPROC
PROC
UPROC
IPROC
NOPROC
INMETER
OUTMETER
METER1
METER2
PANEL METERS
METER2
METER1
LOG/EXP AMPLIFIERS
PROCESS & METER SWITCHES
APTV
APTI
-5V
APTLEDS
+5V
-5V
INPUT SELECT SWITCHING
APT
UNPROC
WEFAX
PROC
TAPE1 PB
APT OUT
TAPE REC
WEFAX OUT
INPUT/OUTPUT AMPS
APT IN
WEFAX IN
TAPE1 IN
TAPE1 OUT
TAPE2 OUT
LED DRIVERS
PSU
+12V
-12V
+5V
-5V
J5
APT IN
GND
J2
WEFAX IN
J1
Tape 1
J6
Tape 2
J4
WEFAX OUT
J3
APT OUT
Rev: 2
Date: 21 JAN 96
Eng: STE
Project: Contrast enhancer - Block Diagram
Company: ?
Address: ?
City: ?
Country: ?
Initial date: 14 OCT 95
Page: 1
of 7

There should be sufficient gain for almost any input level to be adjusted to the 1V p-p (on peak white) required inside the unit. U2 provides a means of gain adjustment for output to a tape recorder.

The block diagram shows input select switching but their is no associated diagram. This arrangement is left to the constructor as everyone will have their own views on what is required. The prototype was able to select any of the APT, WEFAX or Tape inputs as well as bypassing the unit. The signal from the input selector is marked UNPROC. The tape output switch could select any of the unprocessed inputs or the processed output signal (PROC).

You may wish to place the switching before the input amps which permits the unit to be switched off when not in use. The advantage of the arrangement in the block diagram is that all of your signals are brought to a common level even when not being processed which is useful when designing system accessories.

Following the input switching, the signal is applied to a demodulator, a logarithmic amplifier, an exponential amplifier and a buffer.

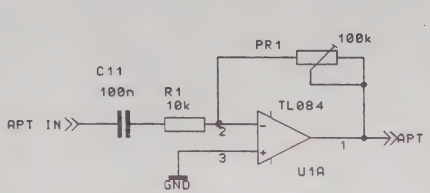
Demodulator/Sync Detector. The demodulator, U3, detects the video envelope so that the sync tones can be extracted to produce logic signals which control the switching between APT visible and IR images.

U3a and b form a precision full wave rectifier with the rectifier balance adjusted by PR5. U3d is a low pass filter with a theoretical -3db point of 1591Hz. In practice, some 4800Hz ripple is present at the output but for this application, the level is acceptable.

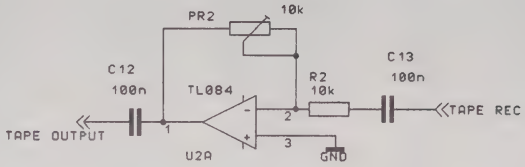
Sync detector U4 and U5 is a slightly modified design by Les Currington (G8LOK) from RIG journal 1. The modification is in the output stage where the logic levels are ±5V rather than the original +12V to simplfy the circuitry around the analogue switches, U7 and U8. The sensitivity of the sync detector is controllable from the front panel potentiometer P1 to ensure proper triggering on sync tones and not on phantom sync frequencies in the image signal. Two LEDs, D1 and D2, show the current vis/IR state of the signal, the alternate flashing indicating correct setting of the sensitivity. The output pulses from U4 are detected and shaped in U5 and then applied to U6 to produce signals APTV and APTI which represent the presence of the visible and IR image segments respectively.

APTV and APTI, along with ±5V, are passed to U7 via the process selector switch to control which part(s) of the image will be processed.

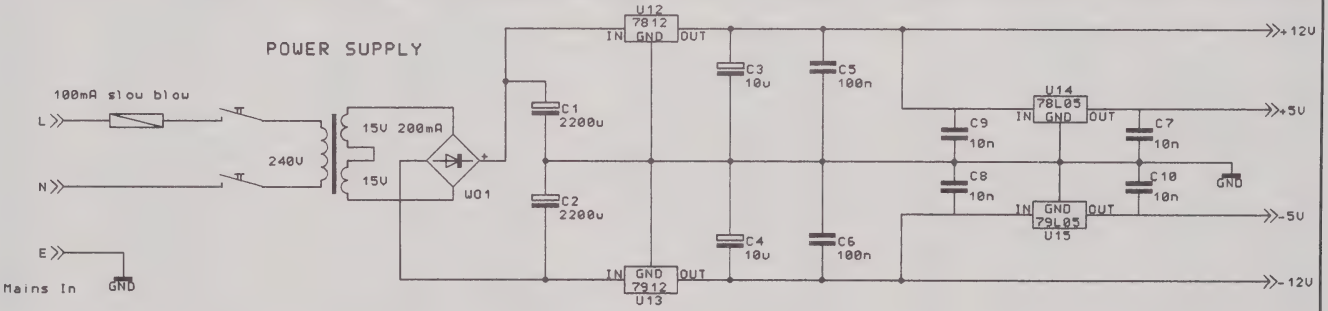
Logarithmic Amplifier. The log amp, U9, processes visible images by amplifying

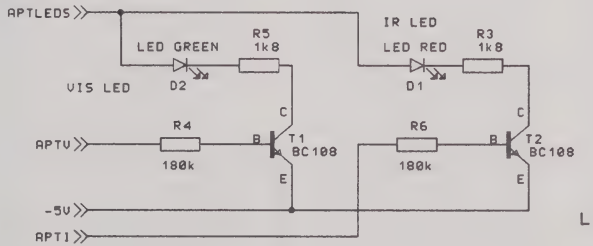


INPUT AMPLIFIER



TAPE OUTPUT AMPLIFIER





LED DRIVERS

Rev 2	Date 21 JAN 1996	Eng STE
Project: Input amp/Tape amp/PSU/Led drivers		
Company: ? Address: ? City ? Country: ?		
Initial date: 14 OCT 95	Page: 2	of: 7

low level signals to a greater degree than high level signals thus compressing the contrast. Two panel mounted potentiometers permit the shape of the log curve and the linear gain to be varied. The curve control also has a three position range switch to allow fairly severe curves to be created! The shape of the curve determines the contrast of the processed image whilst the linear gain permits the peak levels of the processed image to be adjusted so as not to exceed peak white on the display.

Exponential Amplifier. The exp amplifier, U10a, b and d, processes IR images by amplifying low level signals to a lesser extent than high level signals thus expanding the contrast. Two panel mounted potentiometers control the shape of the exp curve and the linear gain.

Buffer. The buffer, U10c, is a voltage follower and provides a source of unprocessed signal.

With the process select switch in any of the APT positions, U7 selects the output of the log amplifier, exp amplifier or buffer according to signals APTV and APTI. Since there is no information in Meteosat and Meteor images to determine whether the image is visible or IR, the selection is made manually by means of other positions of the process select switch.

The output of U7 passes to the rear panel socket appropriate to the selected input.

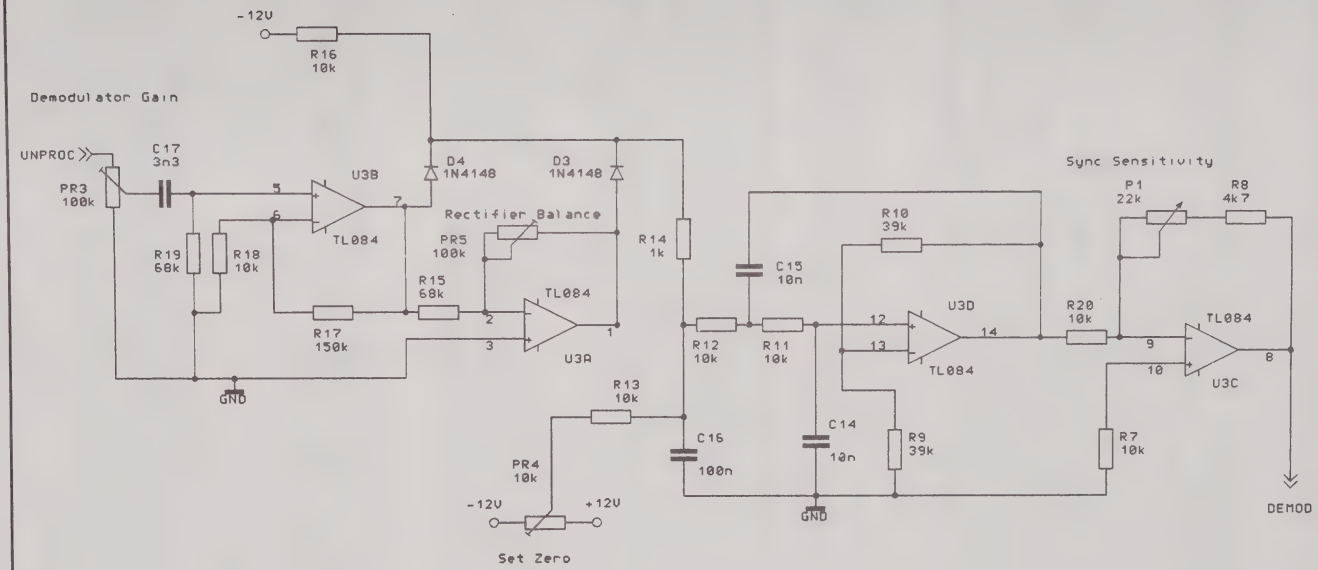
2. Metering (Optional)

Two panel mounted meters monitor the peak or average input and output levels of the log and exp amplifiers and the buffer. The control signals derived for the process select switch are also used to select which part of the image is metered. Either APT visible, APT IR or all of the image line may be selected on both meters. Using two meters permits the peak output level to be matched to the peak input level without waiting for the image to build up on the display. If you wish to use the video display for level setting, the meter circuits can be omitted along with U8 and the meter switch.

Construction

Since this is audio technology, circuit layout is not critical but a metal box to eliminate as much pick-up as possible is recommended and a toroidal mains transformer should be used if the unit is to be placed anywhere near the video monitor. The prototype was built on three strip board panels and mounted in a 300mm x 300mm x 100mm box.

Since the process control switch has five positions and four poles, it will need to be constructed from the Maka-Switch range if nothing else can be found. It is advisable



Rev: 2	Date: 21 JAN 96	Eng: STE
Project: Demodulator		
Company: ? Address: ? City Country: ?		
Initial date: 14 OCT 95	Page 3	of 7

to wire the switch with all links and flying leads for connection the boards before fixing it to the panel.

The prototype used VU meters with scales having sufficient markings to match signal levels easily. If VU meters cannot be found, any meter could be used provided the sensitivity is 1mA or better e.g. 250μA.

When the meters are in the peak reading mode, they are very susceptible to local switching transients. Therefore, be sure to include the protection diodes. The number of diodes required will depend upon the sensitivity of the meters used. The fsd voltage of the meter is calculated or measured, then divided by 0.6. Round the result up to the next whole number and use this many 1N4148 diodes as protection. e.g. my VU meters have an fsd of 1.4V. Therefore $1.4 \div 0.6 = 2.33$ and rounding up requires three diodes.

All TL084 op-amps are supplied with +12V on pin 4 and -12V on pin 11. All logic chips (U5, U6, U7 and U8) are supplied with +5V on pin 14 and -5V on pin 7.

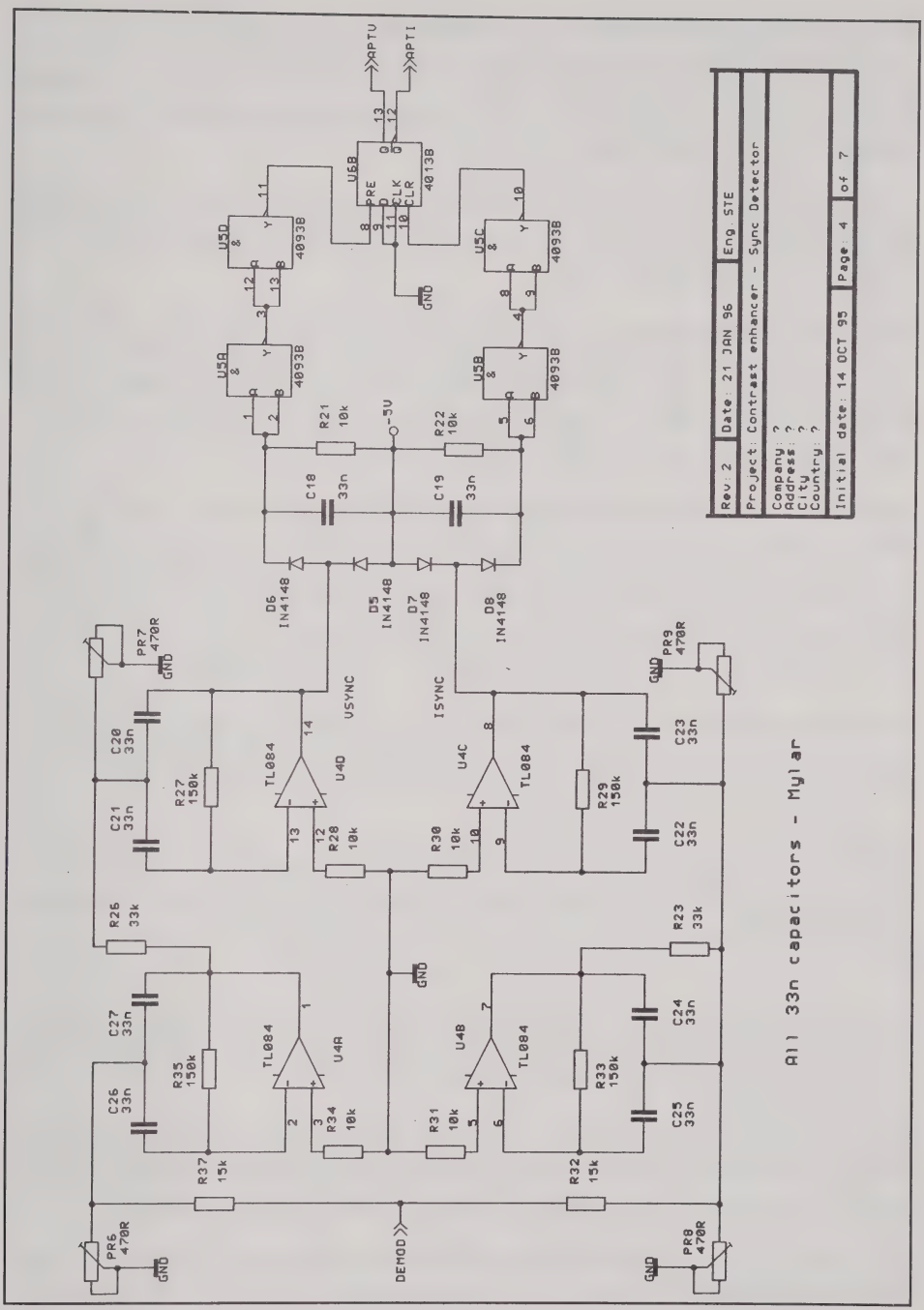
For repeatability of settings, the log and exp curve controls and their associated linear gain controls should have some sort of calibrated scale. I was very fortunate to be given four 10 turn pots and matching 000-999 panel mounted counters which are available from Electromail at about £40 a pair! Cheaper alternatives are available such as Vernier scales but note that these normally only turn the output shaft through 180°. Therefore, unless 180° pots can be found, 22k pots would be needed to obtain the required 10k of travel.

Do not be tempted to use 1N4148 diodes in the exp amp as they produce an amplifier whose characteristic is too steep and setting of the controls is very difficult. It is also almost impossible to approach a linear characteristic with the Exp Curve control.

IC sockets are recommended throughout. As usual, do not install any chips until the supply voltages and polarity have been verified with a meter. Plug in the chips progressively as testing and alignment progresses.

Alignment

Alignment is best carried out with a signal generator and an oscilloscope. If these are not available, however, a method will be described later which will get the unit operating. Alignment will then have to be fine tuned by trial and error. Before doing anything, set the meter presets to the earthy end and set the Log/Exp curve and both Linear Gain controls to minimum.


Rev: 2
Date: 21 JAN 96
Eng: STE
Project: Contrast enhancer - Sync Detector
Company: ?
Address: ?
City: ?
Country: ?
Initial date: 14 OCT 95
Page: 4
of 7
All 33n capacitors - Mylar
VSYNC
ISYNC
DEMOD
GND
-5V
TL084
4093B
IN4148
4013B

With U3 removed, inject about 1V p-p at 832Hz into the sync detector circuit at the point marked DEMOD. With the 'scope, monitor VSYNC and adjust PR6 and PR7 for maximum. Set the frequency to 1040Hz and monitor ISYNC and adjust PR8 and PR9 for maximum. Finally, check that the Q and not Q outputs of U6 change state as the input is swept across 832Hz and 1040Hz.

Connect receivers and tape players to their appropriate inputs and adjust the input amp presets for about 1 - 1.2V p-p output on peak white. Final value is not too critical but don't go below 1V p-p.

Next, align the demodulator. Set P1, PR3, PR4 and PR5 to mid travel. Connect an input signal to one of the input sockets and select that input. Monitor the signal at U3d pin 14 with the scope set to DC and adjust PR3 for a signal amplitude of around 1V. Adjust PR5 for minimum ripple at pin 14. Some ripple will still be present as the filter lacks performance. Set PR4 to centre the signal around zero volts.

With an APT input, the APTV and APTI signals should now become active with P1 at about mid travel and, with the process switch in positions 1, 2 or 3, the vis/IR LEDs should flash alternately. If not, leave P1 at mid travel and adjust PR3 until the LEDs flash. Do not be tempted to turn up the sensitivity (P1) too high else the detector could trigger on 832Hz and 1040Hz components in the video signal. The detector will tolerate some noise on the input signal but do not expect miracles!

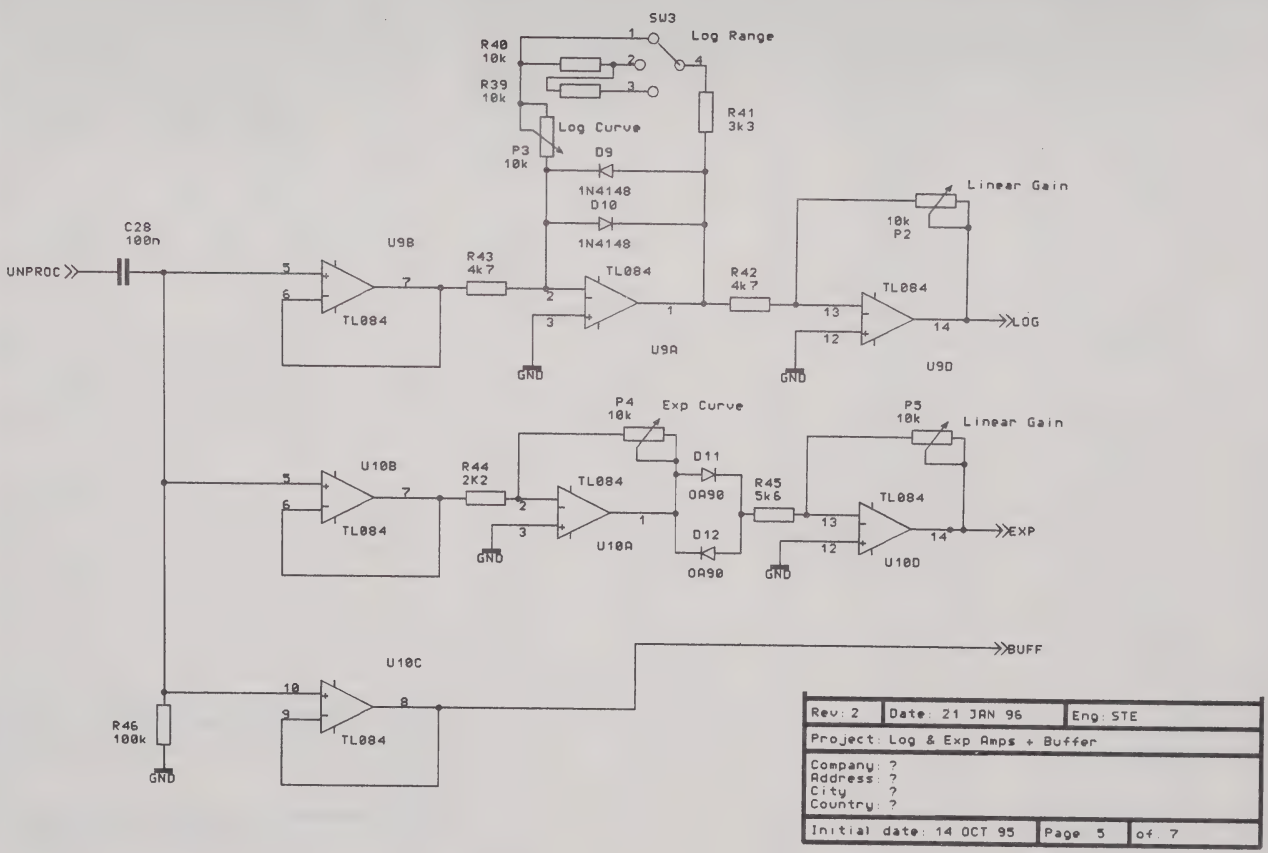
To calibrate both meters to the same level, apply an input signal and turn down the Sync Sensitivity control, P1, until the LEDs stop flashing. If the IR LED is lit, set the process switch to APTV or, if the VIS LED is lit, set the process switch to APTI.

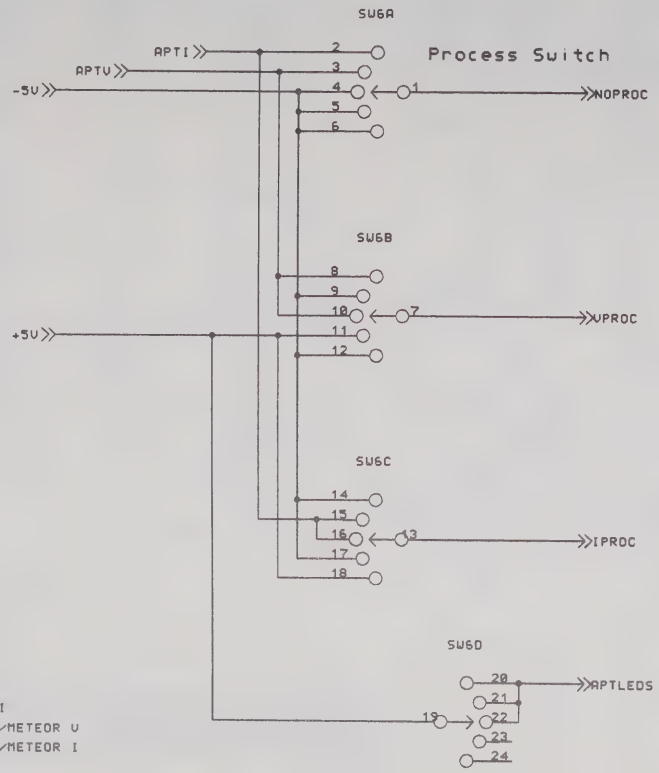
If the IR LED is lit, select APTI on both meter switches. If the VIS LED is lit, select APTV on both meter switches. Set the Peak/Average switches to average. Slowly advance PR10 until the input meter deflects about ¼ fsd. Switch to Peak reading and adjust PR10 for about ¾ fsd. Now carry out the same procedure for the output meter.

If no 'scope or generator are available, aligning the panel meters permits some of the internal levels to be aligned by temporarily using an aligned meter. Final alignment will have to be done by trial and error from there on.

Turn the meter preset PR10 to the earthy end. Using a 10k potentiometer, derive a voltage of +0.6V and apply it to U11a pin3. Adjust PR10 until M1 reads ¾ fsd. The meter is now aligned to give usable readings. Repeat for the other meter.

One of the meters can now be used to check the ouputs of the input amps. Adjust for around ¾ fsd.

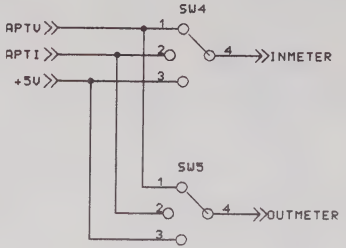

SW3
Log Range
R40
10k
R39
10k
R41
3k3
Log Curve
P3
10k
D9
1N4148
D10
1N4148
Linear Gain
10k
P2
C28
100n
UNPROC
U9B
TL084
R43
4k7
TL084
R42
4k7
TL084
LOG
U9A
U9D
GND
GND
P4
10k
Exp Curve
P3
10k
Linear Gain
U10B
TL084
R44
2K2
TL084
D11
OA90
R45
5k6
TL084
EXP
D12
OA90
U10A
U10D
GND
GND
BUFF
U10C
TL084
R46
100k
GND
Rev: 2
Date: 21 JAN 96
Eng: STE
Project: Log & Exp Amps + Buffer
Company: ?
Address: ?
City ?
Country: ?
Initial date: 14 OCT 95
Page 5
of 7



1. APT V
2. APT I
3. APT VI
4. WEFAX/METEOR V
5. WEFAX/METEOR I

Position 1 is uppermost on all gangs

Meter Switch



1. APT V (Meter visible part of APT line)
2. APT I (Meter IR part of APT line)
3. ALL (Meter all of received line)

Rev: 2	Date 21 JAN 96	Eng STE
Project: Process & Meter Switches		
Company: ? Address: ? City ? Country: ?		
Initial date 14 OCT 95	Page 6	of 7

To align the demodulator, set PR5 to mid travel and adjust PR4 to obtain 0V at U3d pin 14.

Feed an APT signal into the unit, set P1 to mid travel and adjust PR3 until the VIS/IR LEDs flash alternately. This will also require the sync detector to be aligned by trial and error. Without test gear, it will be difficult to know whether each filter has been aligned for the correct tone. If the wrong image is being processed when the unit is finally operating, this is probably the source of the error - simply reverse the connections at points APTV and APTI.

Alignment of PR5 is very difficult without an oscilloscope in which case it should be left at mid travel. Note that the demodulator and sync detector do not form part of the image processing chain, they simply derive the switching signals. If test equipment is not available, it is sufficient to align them by trial and error until vis/IR switching is reliable.

Finally, the tape output amplifiers are set for a convenient record level by adjusting PR2.

Operation

The operation of the unit will be learned quickly by experimentation. However, here are a few guide lines.

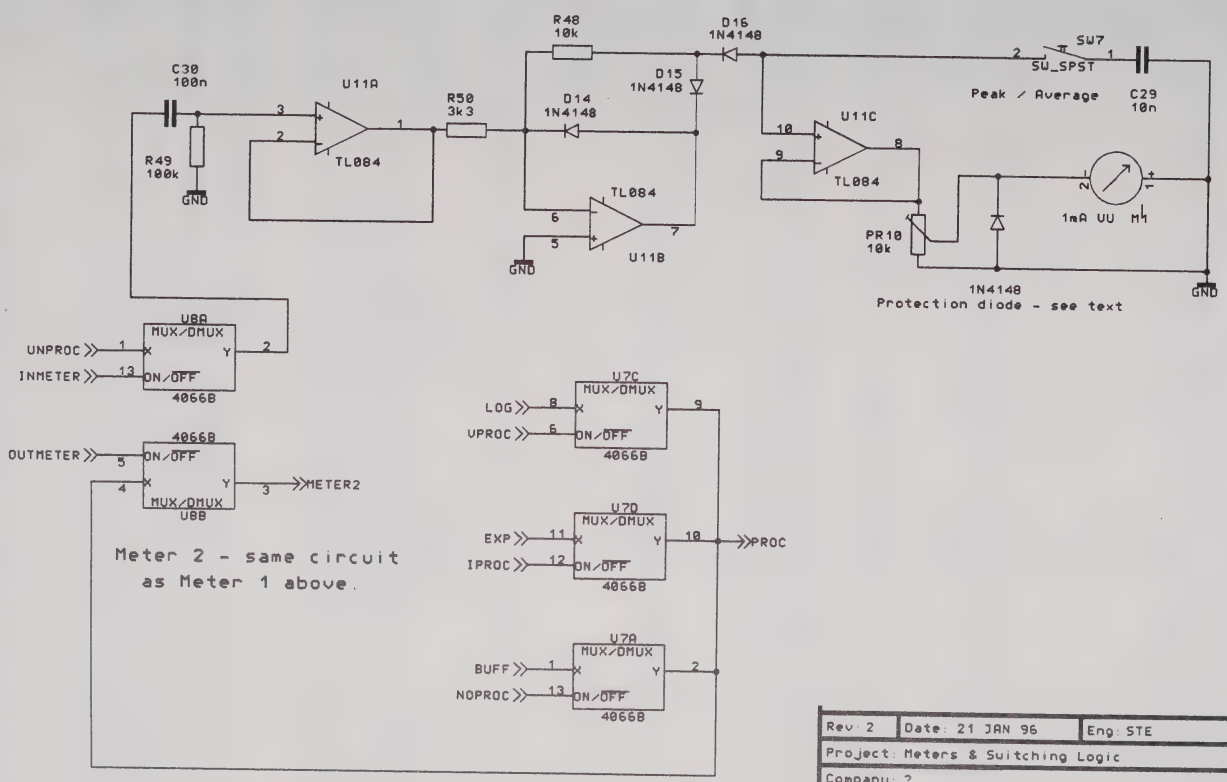
When processing APT signals, the log controls adjust the contrast of visible images and the exp controls adjust IR images. If the meters are fitted, they permit matching of the peak output level to the peak input level which usually occurs in the IR image.

To process Meteosat and Meteor images, set the process switch as required and set the meter switches to ALL.

If recorded images are available, experiment with the controls to see how ground detail can be improved in visible images and how the contrast of night time IR images can be improved.

In Use

The first images were processed in mid-October 1995 when NOAA14 midday images had become considerably darker than the IR images. The processor brought the cloud and ground brightness up to levels similar to midsummer images. Processing of recorded midsummer images showed superb clarity of ground detail.



Rev: 2	Date: 21 JAN 96	Eng: STE
Project: Meters & Switching Logic		
Company: ? Address: ? City ? Country: ?		
Initial date: 14 OCT 95	Page: 7	of: 7

Warning - any IR image covering very hot and very cool areas will be difficult to process with the exp amplifier because of the already high contrast range in the image. Correct adjustment for contrast expansion in the cool area will render the hot area almost totally black! Remember that a black image results from low carrier amplitude. It is within the capabilities of the unit to make an already dark image so dark that the carrier is shut off completely, resulting in the display system losing sync and the picture slewing across the display.

If you are using PROsat II, processing an APT IR does not destroy the ability to read the temperature as the calibrated markings at the edge are processed along with the rest of the image but beware of 'over processing' as outlined above. Driving peak white or peak black beyond the limits of the display hardware will destroy the temperature calibration.

For Meteosat and Meteor images, the minimum configuration requires the Log and Exp amps. For APT images, the minimum configuration requires Log/Exp amps, demodulator and sync detector, vis/IR LEDs, process select switch and U7.

[After reduction to page size, parts of the diagrams may be difficult to read. For those readers who are contemplating constructing this unit, the author has offered to provide a set of larger diagrams upon receipt of a stamped and addressed envelope or two International Reply Coupons (available from most post offices). Sam Elsdon's address appears on page 2. -Ed.] ⊕

DO NOT ADJUST YOUR SET....
...NORMAL RECEPTION WILL RESUME SHORTLY

At about the time this journal reaches members, the Sun's declination (or celestial latitude) will be such that, for north temperate latitudes, the Sun will appear to pass close to geostationary satellites for a short time each day. The effect will to be increase noise and the images may be unusable.

The date of true co-linearity is dependent on latitude and occurs in late winter and early autumn N days before the spring equinox and after the autumn equinox. N is about 20 days for high temperate latitudes, 14 days in mid latitudes and, of course, falls to zero at the equator.

For the UK, the dates are around 2 March and 12 October. On these dates, on the Greenwich meridian, the Sun passes Meteosat 5 at 1212 and 1147UT respectively and noise is likely to be greatest around these times. Meteosat PDUS users will notice that the latter time is midway through the once-daily AV format, high resolution, full disk image transmission. ⊕

A PASSAGE OVER INDIA

Frank Bell

Being located in the south east of England I have received many images of the UK and Europe. Over the years my interest has spread beyond the UK to the limits of reception of signals from the NOAA polar-orbiting satellites which is bounded by the Nile delta, Canary Islands, Baffin Island and the White Sea but it has been my long-standing ambition to receive live pictures of other parts of the world. Although not a regular traveller, I planned a holiday in India over the Christmas period, 1995. With travel and accommodation all booked I had the embryo of an idea to receive live images of India.

Having received images from NOAA satellites for many years I have learned what is needed for a receiving station to acquire good images:

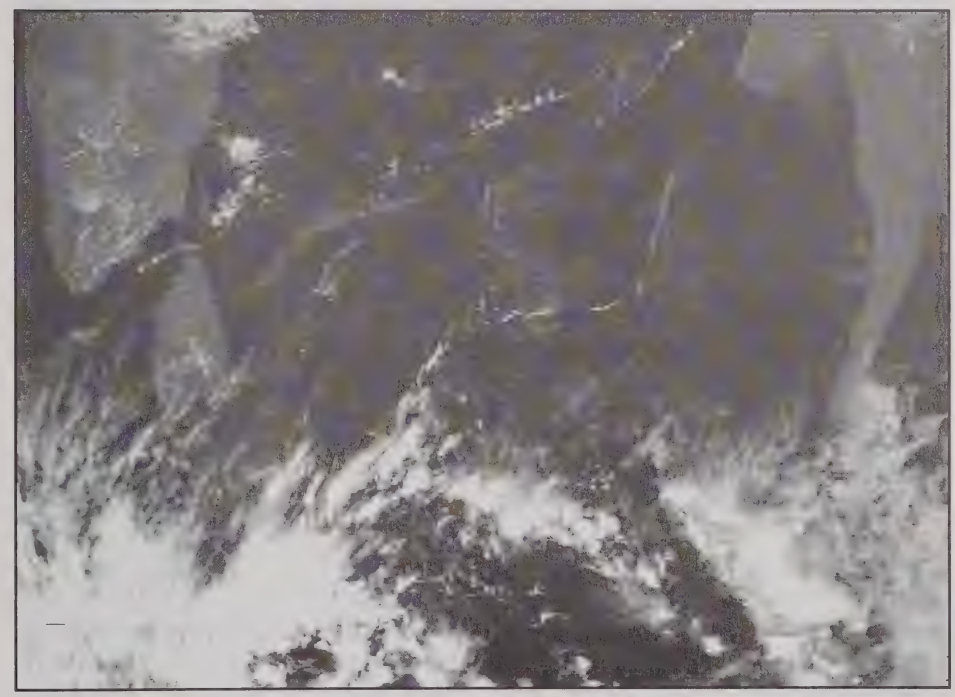
1. A well designed and strategically located antenna.
2. A minimum length of lead from the antenna to the receiver.
3. A sensitive and selective receiver.
4. An interface of some description to a computer.
5. A computer.
6. A power supply.

My problem was how to assemble equipment which would be good enough to receive worthwhile images yet be portable enough to carry in normal holiday luggage; not to mention being able to pass through airport security without ringing the alarm bells.

The receiver presented no problems as, during the summer, I had built a RIG RX1 and it was securely boxed, tested and known to be reliable. The interface I chose to take was the Marlelec JVFAX unit which I sometimes use at home and have found to be easy to use and reliable. An alternative was considered but Timestep wanted £200 for serial interface which would store data in the computer but I considered this far too expensive. It is possible to record the audio output from the radio receiver onto tape but unless a digital tape recorder is used the resulting image quality is so poor that it is hardly worth doing. The decision on signal storage was to send the output from the Martelec JVFAX interface into the serial interface of a lap-top computer which I managed to borrow for the purpose. This turned out to work well with a full resolution file being stored in the computer. I was not too concerned about viewing and processing the image while in India; I just wanted a full resolution file to work on when back home. The graphics card on the lap-top did allow the display of the image while it was being received and it was reassuring to monitor the incoming signal but the image quality was not very high resolution.

The computer had its own built in NiCad battery which could be recharged from the intermittent Indian mains supply. Both the RIG RX1 and the Martelec JVFAX interface need a 12V DC supply. Now it so happened that I had a fist-sized 12V sealed lead-acid battery which I planned to use. However, it turns out that such batteries are forbidden on aircraft. The alternative was to make up a pack of 8 alkaline dry cells thus giving the desired 12V. The power requirement of the receiver and interface is very small and the battery pack turned out to be quite satisfactory for several hours of operation. Perhaps I over did it on battery size; the pack I made up weighed 1.4kg, however, back in the UK it will probably come in handy for starting the car on a cold morning.

The design and construction of a satisfactory antenna turned out to be an interesting challenge. I judged that taking even a short aluminium mast with its active elements in or attached to my luggage was unacceptable. Instead I took the dimensions and spacing of the active elements of the RIG 137MHz crossed-dipoles antenna. I reproduced these in wood using 6 mm dowel and half a broom handle. I used pieces of mains cable which I had in the junk box and cut them to the exact length and attached these to the wooden cross elements. Two terminal blocks were securely at-



NOAA 14. Southern India to Malaysia.

tached to the broom handle and a piece of 50 ohm coax of the exact length was connected between the two terminal blocks to act as a phasing harness. The final connection of the coax downlead was attached to the lower terminal block. The antenna worked well even without the inclusion of the normal reflector elements for this type of antenna. Overhead passes were received strongly with the active elements horizontal, to receive with the satellite close to the horizon it was necessary to tilt the antenna towards the satellite's position. The great advantage of this design was that when in pieces it consisted of bits of wood and wire which could be dropped in a suitcase, was inconspicuous and could be reassembled when needed. Carrying the equipment on the aircraft was not a problem.

I didn't know before hand what the hotel was like and whether I could operate there with a reasonable view of the sky. I had hoped to operate inconspicuously from our room but this turned out to be impractical but the hotel had an open roof terrace with an excellent view of the sky. I didn't ask permission from anybody but one lunch time after running a prediction for a NOAA 14 pass I took the equipment up to the roof and started operations.

So how well did it all go? Remember Murphy's Law? "If it can go wrong, it will go wrong". Certainly I did make mistakes, with software, hardware, predictions and, initially, antenna location. However eventually I had it all sorted out and all worked well. As my main targets were the early afternoon passes of NOAA 14, only one or two a day were available and as I was not at the hotel very often during the day the actual number of opportunities to receive images was not great. As might be expected, a hotel guest out on the roof of the hotel with some bits of wood wire and electrical equipment did attract attention and resulted in a number of roof-top social gatherings. The hotel owner, not surprisingly, took a particular interest in my activities, not because of his interest in weather satellites but for my knowledge of the space industry. It turns out that he is trying to established a satellite TV channel for southern India and I have promised to find some contacts for him. The hotel staff also took an interest. I was astonished when a waiter asked "Are you DXing?". I explained I wasn't but there followed a long conversation about amateur radio. It so happened that satellite imaging was quite topical because while we were there India's IRS-1C satellite was launched by a Russian Molniya rocket and the Indians are to use it to monitor the environment and agriculture in their own vast country. It was headline news in some of the Indian newspapers.

In total I received about ten images of the Bay of Bengal area, Sri Lanka and India and one of them is reproduced here. It turns out that when viewed at full resolution, the images do have a grainy appearence in places and this may be attributable to the antenna. I think for a future expedition I will add reflectors to the antenna to increase the gain.

The wooden antenna with wires attached.

Why did I bother going to all this trouble? Well like most RIG members it's my hobby. It provided a bit of a technical challenge and there was great satisfaction when, from a receiver that I had had built and an antenna made of sticks and off-cuts of wire, sitting near the southern tip of India, the familiar and friendly, "Ping toc, ping toc" of a NOAA satellite came in dead on time. The images are interesting and they will be viewed with nostalgia. However, the main driving force behind the whole project was the social interaction it generated and above all the fun we had. Foreign holidays will never be the same again. I have discovered that I can take my hobby on holiday as well! Egypt next!

RIG*sat* RX1 PCB

In view of the continuing demand for this receiver, a small quantity of additional boards are being made for use with the remaining few crystal filters. Only about 20 more will be available and priority for these will be given to members who requested boards but had their payment returned. Those still interested are invited to re-order.

REMOTE IMAGING, REMOTELY (AGAIN)

David Banks, G7SIQ

Readers of the December 1994 RIG journal will remember Ben Ramsden's article on remote imaging in Iceland, a fascinating story of how to do it the hard way. I live in the hilly Lake District of northern England where my horizons are very restricted but, now that I no longer have to work for a living, I am able to spend long periods in southern Europe and found the idea of extending my eastern and southern horizons very appealing.

I contacted Ben and learned of the problems he encountered. It seems that recording on a portable audio cassette recorder (ACR), though easy to accomplish, can be far from satisfactory. Simple ACRs generally have an automatic level control that cannot be switched off and thus inhibit recording the full range of audio level. Tape speed variations can also create problems. A good Hi-Fi recorder will do the job but mains voltage is required for its operation.

I found a second-hand mains-operated Sharp ACR locally, complete with manual, and established that the rectifiers produced 13 and 25V DC. For an alternative, portable power supply I used a motor-cycle battery in series with my car's battery to produce 26-12.5-0V and it worked!

Libya and Egypt. NOAA 14 vis.

Trials on a high road above my home showed that my Dartcom receiver, fed with a manually tracked crossed dipole antenna (without reflectors), and coupled to my DC-fed Sharp ACR worked as well as my permanent system although faint patterning was sometimes evident upon decoding. On the basis of "anything is better than nothing", I packed my caravan and went to Italy.

From a hill-top north of Siena, Tuscany I recorded about 15 passes over several weeks. Long, noise-free passes taught me much about the advantages of manually following the satellite across the sky with the aid of a signal-strength meter and I was surprised to note the importance of orientating the antenna (rotating it) at low elevations. More images were recorded later from Provence and more recently I went to the Pyrenees south of Perpignan to try to get some good images of north Africa.

From these sites I could receive images from places as far away as Iraq, the Aral Sea and beyond, Saudi Arabia, Sudan and The Gambia. Decoding all these images was a long, but interesting and rewarding job. Two further things remain to be done. Firstly, I must reduce bulk to make the system fit in a back-pack so that I can gain further height to get lower horizons and I would like to find a smaller recorder. Any help with the latter would be appreciated. ⊕

THE MILLENNIUM SATELLITE

Frank Bell

As promised in the last journal, here is a progress report on the proposal for a Millennium Satellite.

My thanks go to those people who have written letters of support for the project. These have proved to be very valuable. Special thanks to the Harrison children, aged 10 and 12 years and their mum and dad; thank you. I just wish more RIG members had offered the same level of support by putting pen to paper.

A recent meeting with the Millennium Commission has been very productive and I now have a high expectation that the Millennium Commission will eventually offer funding for the project.

At about the time this Journal is published, there will be an announcement about the funding for the project. There should be national media coverage of the Commission's list of projects that they will support this year. RIG members should be attentive to this published list to assess the prospects of there being a satellite at the turn of the millennium available to RIG members which is capable of imaging all parts of our planet. ⊕

RIG*sat* IF1 - SYNCHRONOUS JVFAX INTERFACE

Ray Godden & Bryan Taylor

* Low cost - less than £20.
* Synchronous, no more skewed or banana-shaped images, locks to tape recordings.
* Single supply.
* Full resolution - 2.4kHz & 4.8kHz sampling rates.
* Front panel controls for black and white levels.

Application.

This project was inspired by Greg Jameson's article in RIG 42. It is suitable for decoding APT/WEFAX signals. JVFAX has a mode (BidPrintPortIRQ), using the PC parallel port, which is capable of synchronous operation. For this mode a port which can be configured for input is necessary - most I/O cards are suitable and are not expensive.

Signal conditioning and rectification.

The input signal, after VR1 (set white level) and amplification by IC2a, is fed to IC2b, an op-amp band-pass filter: its bandwith is tailored to that of the WEFAX signal. IC2c is a full wave rectifier and its output is coupled to DC amplifier and low-pass anti-alias filter IC2d. After level setting by R16 and R11 the signal goes to IC7, a sample-and-hold function. The sampled signal connects to the positive input of A/D (Analogue to Digital) converter IC5. VR3 controls black level via the negative input to IC5 and the converter voltage range is set by R12.

Phase locked loop.

The 2.4kHz signal is tapped off from IC2b output to phase-locked-loop (PLL) IC3. Internal IC3 voltage controlled oscillator (VCO) is set to free run at 4.8kHz, twice the WEFAX sub-carrier frequency. Its output is divided by two by IC1 and fed to one input of the phase comparator of IC3, the other input of which is driven by the input signal. The error signal of the comparator controls the VCO, so that its frequency is locked to the 2.4kHz sub carrier, compensating for frequency changes due to Doppler shift and/or tape recorder speed fluctuations.

Analogue to digital conversion.

SW1 selects either the 2.4kHz or 4.8kHz output from the PLL to control the sample-and-hold and to initiate the conversion cycle of the A/D IC5. When conversion is complete the output data is latched and IC5 generates an interrupt request pulse via the ACK pin of the computer port.

The 8-bit digital output is fed via PL2 for connection to the PC's parallel port. Current limiting resistors R23-R30 protect both the I/O card and the IF1 for all conditions - PC on or off; parallel port set to input or output; IF1 powered or unpowered. The internal clock generator of IC5 is timed by R20 and C9.

Power supplies.

Regulators IC4 and IC5 generate stabilised 12V and 5V supplies for the integrated circuits. Input supply requirement is a minimum of 15V at 25mA - a 'power plug' type unregulated unit is convenient.

Connecting to the computer.

The interface connects to a parallel port 25-way connector via a 10 way cable. The use of an I/O card with its port set up for LPT2, which is recommended, leaves LPT1 free for your printer and provides additional serial ports should you need them. The connections are as follows:-

10-way (PL2)	25-way (LPT2)
Pins 1-8	Pins 2-9 Data D0-D7
Pin 9	Pin 10 ACK
Pin 10	Pin 25 Ground

Setting up.

The only adjustment, other than the operational controls VR1 and VR3, is VR2 which sets the VCO free-running frequency (4.8kHz). It can be set by measuring the frequency at pin 4 of IC3 or by monitoring the voltage at pin 9 IC3 with a high impedance voltmeter whilst receiving a WEFAX signal. VR2 should be adjusted for a voltage of approximately 2.5V.

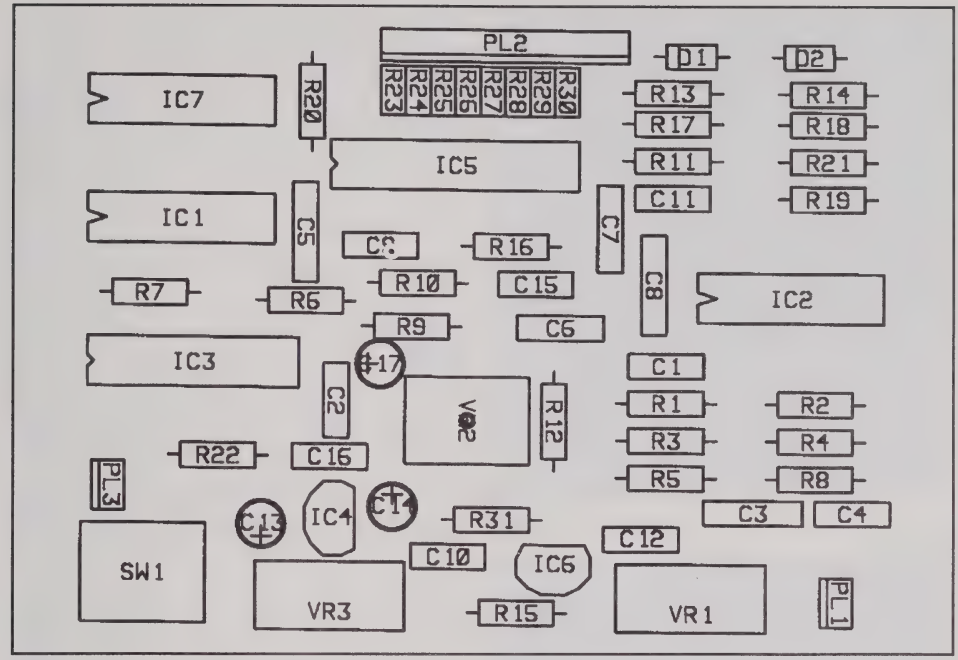
JVFAX

After starting JVFAX select (c) Change configuration. Set Interface to BidPrintIRQ, Addr. and IRQ to correspond to your I/O card - typically 0278 and 5. For further information refer to the documentation which comes with JVFAX. The articles by Mark Pepper in RIGs 38 and 39 are also very helpful.

RIG*sat* IF1 kit

A printed circuit board with full building instructions and parts ordering information is available from RIG. Prices including postage are:- UK £4.50, overseas (airmail)

Rigsat IF1 JVFAX interface
Input
PL1
VR1
100k
C1
10n
R2
22k
IC2a
TL074
R1
100k
R3
100k
+5V
GND
R4
10k
R5
2k2
C3
100n
C4
1n
IC2b
TL074
R6
330k
C15
10n
R8
22k
R9
5k6
C5
100n
R10
4k7
VR2
2k7
C8
100n
IC2c
TL074
D1
1N4148
D2
1N4148
R13
18k
R14
18k
R17
120k
R18
120k
R19
120k
IC2d
TL074
C11
220p
R21
560k
IC7
4007
C7
47n
R11
2k2
R16
2k2
R22
18k
VR3
10k
R15
10k
C9
56p
R20
10k
IC5
ADC0804
IC6
78L05
IC4
78L12
C13
47u/16V
C12
10n
R12
390
C17
47u/16V
C14
100u/16V
C16
10n
R31
390
PL2
PL3
+12V
+15V
IC1
4013
IC3
4046
SW1
WRG 23/01/96



£5.00. For the ordering procedure see 'Shop Corner'. Arrangements have been made for the supply of parts on the PCB as a kit. Order from Cirkit as : 'IF1 kit, Stock No. 41-10030'. Price £10.95 + VAT. Cirkit's details : Cirkit Distribution Ltd., Park Lane, BROXBOURNE, EN10 7NQ. Tel. 01992 448899, Fax 01922 471314.

FAXCONV: A REALLY SMALL WX-SAT PROGRAM

John Boyer G0WRX

Introduction.

Sometime ago I came across a guy referring to 'His weather sat program.' I contacted him and he sent me this amazingly small program that takes sampled APT as transmitted in the 137MHz band and converts it to a raw image. The executable is 613 bytes! Yes I did say bytes. The program was written in assembler and the executable is called Faxconv.com. Just a small note for those of you wondering what the difference is between a .com file and a .exe. The difference is that a .com file must be less than 64kB a .exe can, of course, be any size. I have had a play with faxconv and am quite impressed with how well it works despite a very simplistic approach. There are a few artifacts on received images but a chat with the author assured me that he doesn't have any problems. Perhaps it is something silly my end.

What does it do?

First, a pass has to be sampled and saved on disk. It is fairly important to sample in mono at 44.1kHz which is a standard sampling rate on most soundcards. The main reason for this high sampling rate is improve the accuracy of the demodulation. The amplitude of the APT tone corresponds to the brightness of the picture. The louder the tone then the whiter the picture the quieter the tone then the darker the picture. The problem is that we don't want the tone but just it's loudness. So what we do is look for the peaks in the tone and measure them. Faxconv does this by comparing each sample with the last one until it finds a peak. Figure 1 shows a portion from a sampled file. The samples follow the waveform quite well. Imagine, if half those samples were missing or even more, a sample might miss the peak and that could spoil the picture.

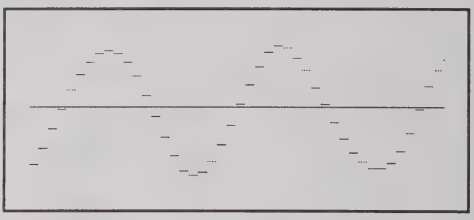


Figure 1

Faxconv then examines each peak and if it is below the half way line it makes it 0. It then multiplies the samples by 2. That gives us 128 grey levels ranging from 0 to 255.

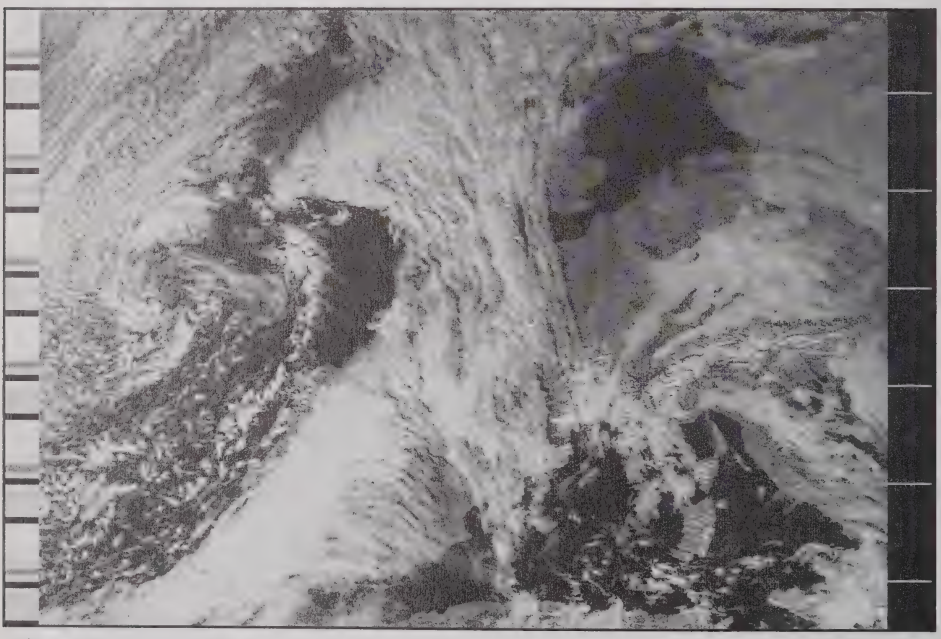


Figure 2

If we just take the amplitude above the centre line (128 level) then we will end up with a very washed out picture. Then the peaks (our picture) are saved to disk in the form of a file called wefax.raw. Voila. Faxconv has done it's bit.

Figure 3

What do you have to do?

You must first record the pass as mentioned in the previous section and of course run Faxconv. The sampled pass is huge. A 10 minute pass recorded at 44.1kHz should yield a file that is over 26Mbytes! The Faxconv output raw image file for the same 10 minute pass is considerably smaller at around 2.8Mbytes. The format of this picture is 2400 bytes per line. So what you have to do is look at the size of the file and divide it by 2400 to get the number of lines. You can use a program like Paintshop Pro (version 3 or later) to examine the image. There is an explanation of how to do this in RIG 43 in an article by Les Hamilton entitled 'Satellite Image processing with Paintshop Pro'.

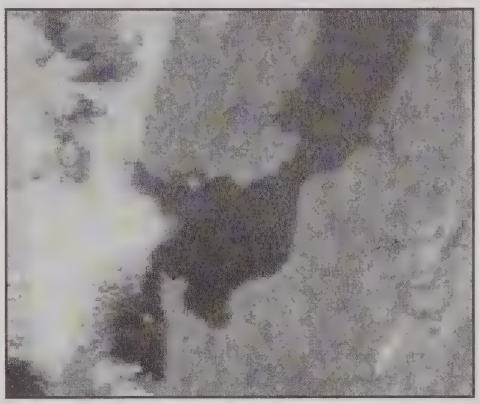


Figure 4

Let's see the results.

Enough of the theory and waffle, it's time to see some results. These examples are all from Noaa 14 passes I recorded not so long back. Figure 2 shows a large visible section of a pass processed using Faxconv. Compare it if you will to other images printed in this journal. As a more direct comparison I have included an expanded section from this image and a similar section as received by my proprietary kit. Figure 3 is the Faxconv image and Figure 4 is the other. Note the artifacts on the Faxconv image that I am sure can be sorted. The quality of the two images is comparable. I think that Faxconv is a program that is worth having a play with if you are just getting into weather satellites and you already have a soundcard.

The short FAXCONV.ZIP file has been belatedly added to DISK 44. See Shareware Corner for details on how to get this disk

VARIATION ON A THEME. An Alternative Use for the RIG*sat* IF1

Bryan Taylor

Late last year I was doing some work on aerial performance as I was convinced that my system was capable of producing better results. The main weapon was an "old faithful" X/t chart recorder connected to the signal level point of the RIG RX1 receiver. The early results confirmed my suspicions. There were more troughs and peaks than on the average fairground ride. By the time the weather had closed in I had made some improvements and resolved to pursue the matter in the spring.

At about this time, Ray Godden had produced the first prototype of his synchronous interface and we started down a, by now, well trodden road of testing and refining the design. As you will see from an article elsewhere in this issue, this has now reached a successful conclusion.

What we were doing was putting data into the parallel port from a simple A/D converter so I wondered if it would be possible to use the same device to create an electronic version of the chart recorder. I know only one computer language, BASIC, but I had produced a number of useful programmes using this easy to understand, but somewhat slow, code.

The first step was to see if the parallel port could be accessed from the version of

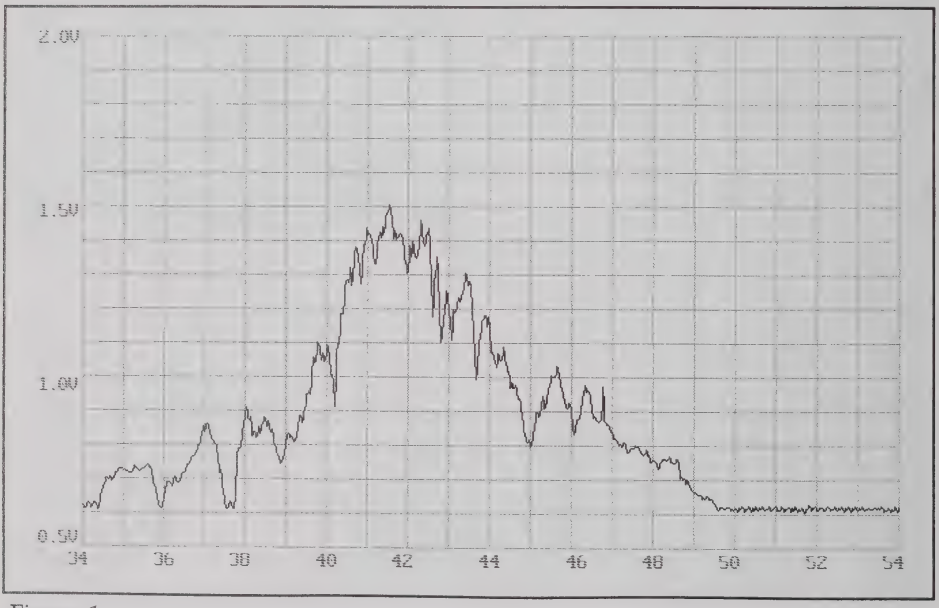


Figure 1

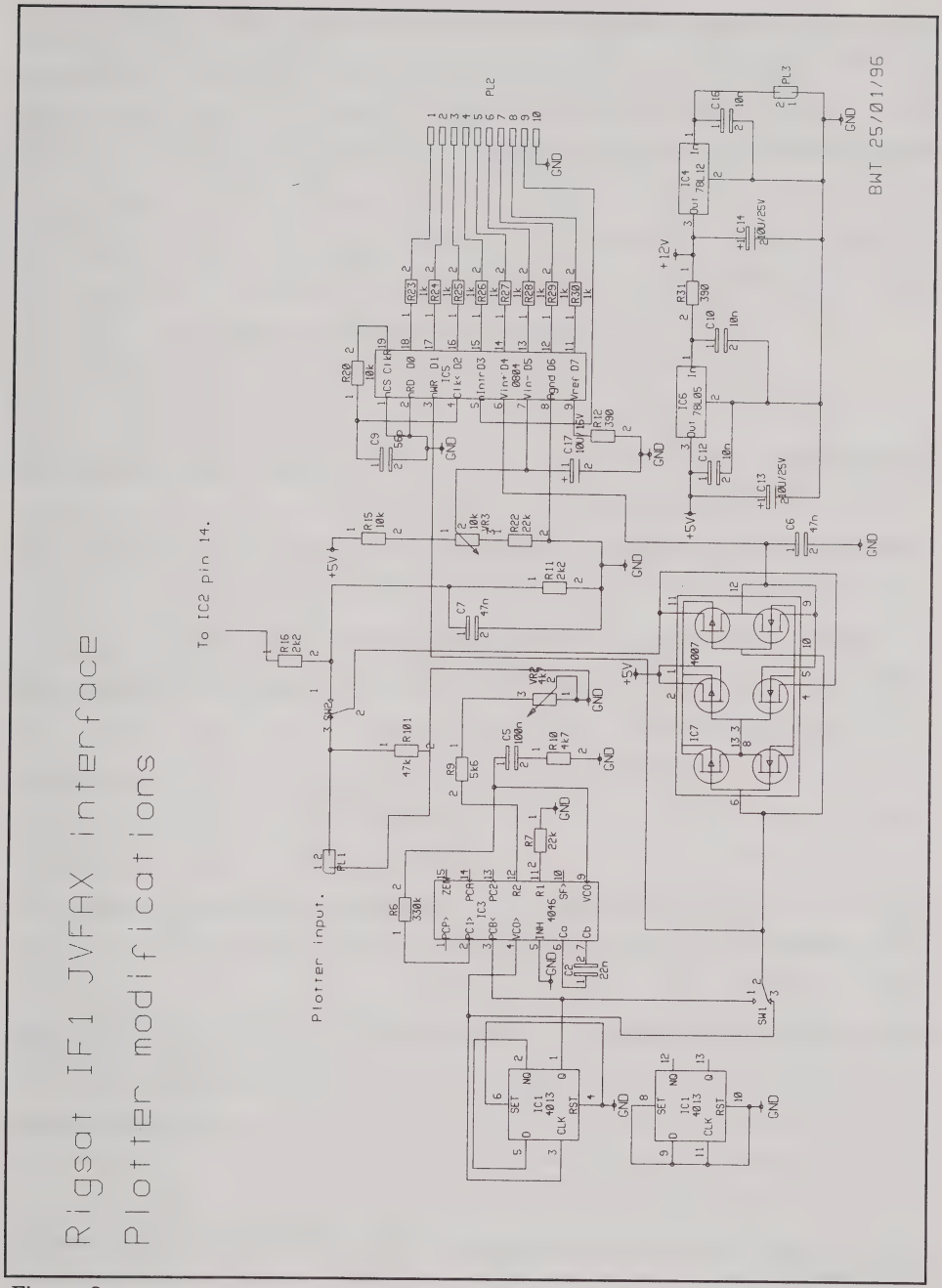

Rigsat IF1 JVFAX interface
Plotter modifications
BWT 25/01/96
To IC2 pin 14.
Plotter input.
+5V
+12V
GND
IC1 4013
IC3 4046
IC4 78L12
IC5
IC6 78L05
IC7 4007
SW1
SW2
PL2
PL3

Figure 2

basic on my machine (QBASIC). The following five-liner quickly gave the answer; yes. Incidentally, this also answers the question "is my parallel port bi-directional?" If it is, varying the I/P to the eight data lines will alter the value shown on the screen. If all you get are zeros the answer is probably no. This need not be a big problem as bi-directional cards can now be purchased from Cirkit and elsewhere for under 10 pounds.

```
'Set port to bi-directional mode
    OUT &H27A, 32  'for LPT1 use &H37A
    DO
        PRINT ; INP(&H278) 'For LPT1 use &H378
        IF INKEY$ = CHR$(27) THEN END '(escape route)
    LOOP
```

Having satisfied myself that I could read the data, the next question was, of course, how fast?. The answer; not very. Reading the port is reasonably quick but the QBASIC programme soon cures that and two readings a second seems to be about the maximum. However as you will see from the chart (Fig 1), which shows sampling once every two seconds, this is more than adequate to produce good aerial profile plots.

The modifications needed to convert the interface are shown in Fig 2. To my mind, it might be worthwhile producing a separate, dedicated unit, in which you only need to provide the components necessary to drive the A/D leaving out the I/P amp and its associated components.

Most of you will probably be happy to produce your own version of the software. However, I have made mine (including a README.TXT file) available to Les Hamilton and it is available from him in the usual way. I should add that the programme runs well but it does not have full validation of all the inputs from the keyboard. However the worst that will happen if you input some inappropriate information is for the programme to hang and need to be restarted. If there is sufficient interest I might be tempted to do some more work on it!

Once you have the system up and running its use is not limited to aerial plots. Part of my programme looks for and stores any valid passes as they appear. This means that if it is left running it will provide a log of all the passes that are received. In addition, it could be used to log any source that has, or could be configured to have, a 0 to 2.0V output; temperature, wind speed or barometric pressure to name but a few.

[Bryan's programme has been belatedly added to disk RIG44; see Shareware Corner in this issue. Ed] ⊕

A BEGINNERS' GUIDE TO USING JVFAX WITH POLAR ORBITING SATELLITES

Les Hamilton

Like many fellow RIG members during the past twelve months, I decided to invest in a JVFAX interface to take advantage of Eberhard Backeshoff's marvellous software package. The regular flow of articles in RIG praising its performance was hard (impossible!) to resist, and I took the plunge exactly a year ago. The plan had been to spend time during that Christmas break getting JVFAX up and running but, with the usual festivities and visits etc., it never happened. It was not till my summer vacation that I found time on my hands and got started.

The principal reason for this delay was the fact that JVFAX is by no means an easy or intuitive program to use. There are no pull-down menus to guide one through its intricacies and a considerable amount of time and hard work is required to master it. Nevertheless, patience brings its rewards with images of stunning clarity and detail.

The first thing to strike me was that, although the manual is comprehensive and detailed, it does not cover the capture of signals from Polar Orbiting Satellites in a cohesive or organised manner. Very much the reverse; I found myself jumping back and forth through the text trying to piece everything together. Now, after several months of using JVFAX, I have come to terms with it very much on a try-and-see basis, punctuated by thumbing through the now well-worn and heavily highlighted user manual. The purpose of this article is to set out a simple and organised approach to getting the best use out of JVFAX when decoding signals from the Polar Orbiting WxSats.

Installing JVFAX

The various JVFAX files and directories come in the form of an archive file which must be copied to your hard drive, then executed. Running the file prompts the user whether certain directories should be expanded or not. If you reply 'no' to any of these prompts, an error message appears at the conclusion of installation. This should be ignored. It is a "red herring" - there are no errors. The program is initialised by invoking the file JVFAX.EXE.

Configuring JVFAX

The first time you actually run JVFAX, its configuration screen is presented. This may look daunting with so many potential inputs to be made, but in fact very few of the fields need be changed at all. If, like many RIG members these days, you have invested in the Martelec JVF interface, you must set the 'Demodulator' field at top left to '8 bits serial'. To achieve this, activate the field with the mouse or cursor keys,

then press the +/- keys as appropriate to cycle through the built-in options until '8 bits serial' is displayed in the field.

The 'Address' field must contain the base address of one of your computer's COM ports. If your serial mouse occupies the COM 1 port, as is usual, the interface must connect with COM 2, and the base address must be altered to 02F8. If COM 1 is free, and you choose to connect the interface to this, leave the base address as 03F8.

The 'Baudrate' field must be set to 9600, and the 'Dtarate' field to 4800. Step through the 'Graphics' field to select the most appropriate choice in keeping with your graphics card; if your graphics card has VESA capability, this is the most appropriate setting. Finally, it is probably worth setting the 'Store GIF 89a' option to "no". To confirm all these settings and exit the Configure Screen, hold down the <control> key, then press the <enter> key at the same time.

Setting a Default Satellite

The 'Miscellaneous' settings option near the foot of the Configure Screen opens the way for some of the more advanced features of the JVFAX set-up. After clicking on this field, pressing the <escape> key displays the set of advanced options. Only one of these concerns us at this juncture, the 'Initial RX Mode' setting. Use the up/down cursor arrow keys to highlight this option, then the +/- keys to select the setting of your choice, say 17 - NOAALLSN. This setting will make JVFAX automatically start up ready to decode the mid-day ascending NOAA satellite (currently NOAA 14). Confirm this setting by pressing Ctrl-<enter>, which returns you to the Configure Screen. Press Ctrl-<enter> once more to exit the Configure Screen altogether.

Receiving Images with JVFAX.

Once the above steps have been completed, JVFAX should be ready to acquire weather satellite images. The time has come to test your system. Running the program by typing JVFAX at the DOS prompt instigates a brief virus check after which the Main Menu screen appears, with the uppermost menu option, FAX highlighted. This is the mode via which JVFAX decodes the APT transmissions from polar orbiting

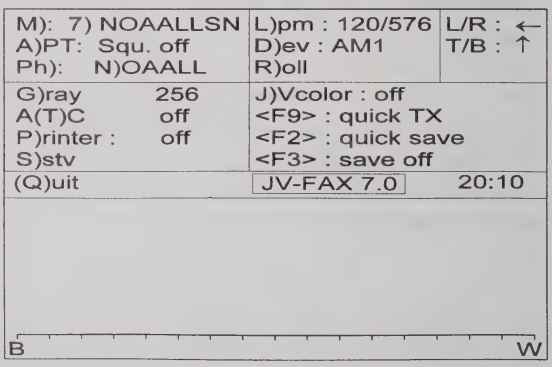


Figure 1.

satellites and it is activated by pressing either the <F> or <enter> key. The screen now blanks, and the Parameter Window (fig. 1) is displayed. Many of the parameters governing the operation of JVFAX may be altered from within this screen, but only one need be considered meantime, the <f3> function key. Pressing this key toggles the SAVE state of JVFAX between off and on. Normally you will wish to press <f3> before signal acquisition in order to save the resulting image automatically to your hard drive. If you forget to do this, you may not be able to save your entire image.

All that is needed now to obtain a NOAA 14 image is to connect the JVFAX interface to the appropriate COM port of your computer with the lead supplied, and connect the audio output from your receiver to the black, 'APT in' socket on the JVFAX interface. As soon as the satellite comes within range, and its signal becomes audible, the lower half of the Parameter Window displays the intensity histogram produced from the APT signal.

Signal Level Calibration

To ensure that a satellite signal 'trips' JVFAX, and starts the signal decoding process correctly, it is essential that the input level of the signal be correct. Too low a signal, and nothing happens at all; an over-strength signal and the screen simply fills with peak white.

Several RIG members I have spoken with were initially puzzled by the fact that they always obtained a completely white screen at this point no matter how they adjusted the JVFAX control. This effect occurs when the receiver output is so strong that the interface is being overloaded whatever the setting of its control knob. The problem is easily overcome by fitting a potentiometer (10 kilo-ohm is sufficient) into the audio lead between the receiver and your JVF interface. This can be adjusted to attenuate the signal to an acceptable level. Connections to the potentiometer are shown in fig. 2.

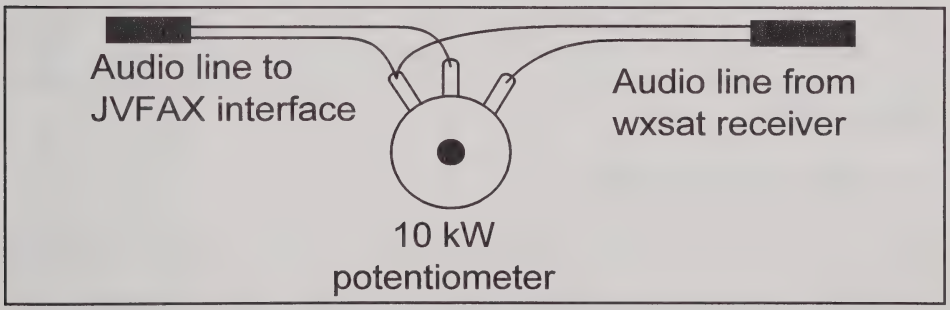


Figure 2.

With a satellite signal active, set the JVF level control to its minimum setting, then examine the histogram in the Parameter Window. The crucial factor is now to increase the signal strength until the peak white band at the extreme right-hand end of the histogram is active. This can be recognised as a white spike which pulsates in time with the audible satellite signal, and which is positioned directly above the 'W' symbol at the extreme right-hand end of the histogram. As you gradually increase the JVF level control, you should notice the screen make a noticeable 'jerk' as soon as this state is achieved. There will be a couple of seconds delay as the software analyses the satellite synchronisation pulse, then the image starts to build up, line by line, from the foot of the screen. This is accompanied by the "A)PT : Squ. off" line in the Parameter Window changing to "on". It's worth checking whether you have remembered to press <f3> to activate the save routine. If not, you must interrupt reception by pressing the <A> key, then press <f3> quickly before the program locks on to the signal and resumes decoding again.

Correction of Image Slant

Once the input level has been set as above, it should not have to be changed again until you change to a Meteor or Okean satellite. But your first satellite image is unlikely to meet with instant approval. You will almost certainly now face the problem of image skew, where the image slants across the screen. An example of this can be seen in RIG 41, page 35. JVFAX uses the frequency of the PC's internal clock as its timebase, and as these clocks vary considerably from one computer to another, calibration is needed before images are produced with good vertical alignment. The procedure involves waiting until the image fills the screen as fully as possible, and then pressing the "/" key to the right of the full-stop on your keyboard. This results in a vertical white line appearing over the image. This line must be aligned parallel with an edge of the satellite image. The left / right cursor keys slant this line, while pressing the <ctrl> key simultaneously with the cursor keys moves the line bodily across screen. Once the line has been positioned parallel with the image margin, press <enter> to complete the calibration, and all subsequent images captured should display perfect vertical registration. If the process does not work perfectly first time, it can be repeated on subsequent images until you are satisfied. Note however, that this operation is best performed on an image occupying the entire screen. Otherwise, curvature of the image margin as a result of the Doppler effect makes exact alignment difficult.

The JVFAX Acquisition Modes

JVFAX comes with a total of 20 acquisition modes, some of them already holding default settings. Six of these modes are set up for the polar orbiting weather satellites. Mode 6 (northbound) and Mode 8 (southbound) are used for decoding of the Russian Meteor satellite transmissions, while Modes 7 and 9 decode the respective

PREDICTED TIMES (GMT) FOR AQUISITION OF SIGNAL FOR 52.5 DEG NORTH, ZERO DEG EAST

	NOAA 12				NOAA 14				OKEAN 4				SICH 1			
	Period 101.28 mins				Period 102.07 mins				Period 97.75 mins				Period 97.78 mins			
	137.50MHz				137.62MHz				137.40MHz				137.40MHz			
	S'bound		N'bound		S'bound		N'bound		S'bound		N'bound		N'bound		S'bound	
10 Mar	0630	0810	1757	1939	0141	0322	1134	1314	0825	1004	2246	2425	0754	0933	1801	1939
11	0608	0748	1736	1917	0130	0311	1123	1303	0852	1031	2134	2312	0646	0821	1829	2006
12	0727	0907	1714	1854	0119	0300	1252	1434	0918	1057	2203	2340	0711	0848	1717	1855
13	0705	0845	1652	1832	0109	0249	1242	1423	0807	0946	2053	2227	0737	0916	1743	1922
14	0643	0823	1631	1811	0058	0238	1231	1412	0834	1011	2117	2254	0627	0804	1633	1810
15	0621	0801	1748	1930	0228	0409	1220	1401	0722	0902	2143	2320	0653	0831	1659	1838
16	0600	0739	1727	1907	0216	0358	1209	1350	0749	0927	2033	2208	0720	0858	1727	1904
17	0717	0858	1706	1845	0206	0347	1158	1339	0815	0952	2059	2234	0610	0748	1615	1753
18	0655	0835	1643	1824	0155	0336	1148	1328	0703	0840	2126	2301	0636	0814	1642	1820
19	0634	0814	1623	1801	0144	0325	1136	1317	0730	0907	2014	2149	0703	0842	1709	1847
20	0612	0752	1740	1920	0134	0314	1126	1306	0755	0934	2040	2216	0554	0731	1736	1915
21	0730	0911	1718	1858	0122	0304	1118	1255	0644	0822	2105	2242	0621	0757	1625	1803
22	0709	0849	1656	1836	0111	0252	1244	1426	0711	0849	2131	2310	0510	0645	1652	1830
23	0647	0827	1635	1814	0101	0241	1233	1415	0601	0737	2020	2157	0537	0714	1719	1857
24	0626	0805	1752	1933	0230	0412	1222	1404	0626	0804	2045	2225	0601	0739	1608	1746
25	0604	0743	1731	1911	0219	0401	1211	1353	0651	0830	2112	2254	0454	0627	1635	1813
26	0721	0902	1709	1849	0208	0349	1201	1342	0540	0718	2001	2138	0519	0655	1523	1701
27	0700	0839	1647	1827	0158	0339	1151	1331	0607	0745	2026	2205	0544	0722	1550	1728
28	0639	0818	1928	1805	0147	0328	1139	1320	0634	0810	1917	2054	0436	0610	1440	1617
29	0616	0756	1743	1924	0136	0317	1129	1309	0521	0700	1942	2119	0501	0638	1506	1643
30	0734	0914	1722	1902	0125	0306	1120	1258	0548	0725	2007	2147	0527	0705	1534	1711
31	0712	0852	1700	1840	0114	0255	1247	1428	0615	0752	2034	2213	0417	0553	1422	1600

	NOAA 12				NOAA 14				OKEAN 4				SICH 1			
	S'bound		N'bound		S'bound		N'bound		S'bound		N'bound		N'bound		S'bound	
01 Apr	0651	0831	1639	1818	0104	0244	1236	1418	0502	0641	1923	2100	0443	0621	1449	1628
02	0629	0809	1756	1938	0233	0415	1225	1406	0529	0706	1948	2127	0509	0648	1516	1654
03	0607	0747	1735	1915	0222	0404	1214	1356	0555	0733	1838	2015	0401	0538	1404	1543
04	0726	0906	1713	1853	0211	0353	1204	1345	0445	0621	1906	2042	0428	0603	1432	1609
05	0704	0844	1652	1831	0201	0341	1153	1333	0510	0647	1929	2109	0452	0631	1459	1637
06	0642	0821	1631	1809	0150	0331	1142	1323	0536	0714	1821	1958	0342	0520	1346	1525
07	0620	0759	1747	1929	0140	0320	1132	1312	0424	0602	1847	2022	0408	0546	1414	1552
08	0559	0736	1726	1906	0128	0309	1121	1301	0451	0628	1736	1910	0259	0434	1441	1620
09	0716	0857	1704	1844	0118	0258	1250	1432	0517	0655	1800	1936	0326	0502	1331	1508
10	0654	0834	1642	1822	0107	0247	1239	1420	0406	0544	1826	2003	0351	0528	1357	1534
11	0632	0813	1622	1800	0236	0418	1228	1410	0433	0609	1716	1852	0242	0417	1245	1423
12	0611	0751	1738	1919	0225	0407	1217	1359	0458	0636	1742	1918	0309	0444	1312	1451
13	0728	0909	1716	1857	0214	0355	1207	1347	0346	0525	1806	1945	0334	0511	1339	1517
14	0706	0847	1655	1835	0204	0345	1156	1336	0413	0551	1658	1833	0225	0359	1407	1545
15	0644	0825	1634	1813	0154	0334	1146	1325	0301	0440	1723	1859	0250	0427	1256	1433
16	0623	0804	1613	1752	0142	0322	1134	1315	0327	0505	1748	1926	0317	0454	1322	1500
17	0601	0742	1730	1910	0132	0312	1124	1304	0354	0532	1639	1814	0207	0344	1211	1350
18	0719	0900	1708	1848	0121	0301	1253	1435	0421	0559	1704	1840	0233	0409	1238	1417
19	0658	0838	1646	1826	0110	0250	1242	1424	0309	0446	1729	1907	0258	0437	1305	1443
20	0636	0816	1626	1804	0059	0239	1232	1413	0335	0513	1756	1936	0150	0325	1154	1333
21	0614	0754	1742	1923	0228	0410	1221	1402	0225	0402	1644	1821	0216	0352	1221	1400
22	0732	0913	1720	1901	0217	0359	1210	1351	0250	0428	1710	1848	0241	0420	1248	1426
23	0710	0851	1659	1839	0207	0348	1159	1340	0317	0454	1736	1917	0131	0308	1137	1315
24	0649	0830	1637	1817	0156	0337	1149	1329	0205	0343	1625	1803	0158	0335	1204	1342
25	0626	0808	1754	1936	0145	0326	1138	1318	0231	0409	1651	1830	0223	0403	1230	1409
26	0605	0745	1733	1914	0134	0315	1127	1307	0258	0435	1540	1717	0114	0250	1120	1258

	NOAA 12				NOAA 14				OKEAN 4				SICH 1			
	S'bound		N'bound		S'bound		N'bound		S'bound		N'bound		N'bound		S'bound	
27 Apr	0723	0904	1711	1851	0123	0304	1117	1256	0145	0326	1606	1744	0141	0317	1146	1324
28	0702	0843	1650	1830	0112	0253	1245	1427	0212	0350	1457	1632	0031	0206	1214	1352
29	0640	0820	1628	1807	0101	0242	1234	1416	0239	0416	1524	1659	0057	0233	1240	1418
30	0618	0758	1746	1926	0231	0413	1224	1405	0127	0305	1548	1725	0124	0301	1129	1307
01 May	0558	0737	1725	1905	0220	0402	1213	1354	0153	0331	1438	1613	0014	0149	1156	1334
02	0714	0855	1703	1843	0209	0350	1202	1343	0220	0358	1504	1640	0039	0216	1045	1223
03	0553	0833	1641	1820	0158	0340	1151	1332	0108	0246	1531	1706	0106	0243	1112	1250
04	0631	0811	1620	1759	0148	0329	1140	1321	0134	0313	1420	1554	0000	0131	1139	1317
05	0609	0749	1737	1918	0137	0318	1130	1310	0201	0339	1446	1620	0022	0158	1028	1206
06	0727	0908	1715	1856	0127	0307	1119	1300	0049	0227	1509	1647	0048	2338	1055	1413
07	0705	0846	1653	1833	0116	0256	1248	1430	0116	0254	1400	1535	0114	0254	1122	1300
08	0644	0824	1632	1812	0107	0245	1237	1419	0142	0320	1426	1602	0004	0142	1010	1148
09	0621	0802	1610	1749	0234	0415	1227	1407	0031	0209	1450	1628	0031	0209	1037	1215
10	0559	0740	1728	1908	0223	0405	1215	1357	0057	0235	1341	1516	0057	2347	0926	1104
11	0717	0859	1706	1846	0212	0353	1205	1345	0125	0301	1407	1543	0124	0307	0952	1131
12	0656	0836	1644	1824	0202	0342	1154	1334	0011	0151	1232	1610	0013	2303	1019	1158
13	0635	0815	1623	1802	0151	0332	1144	1323	0038	0216	1321	1457	0040	2330	0908	1047
14	0613	0753	1741	1921	0140	0321	1132	1312	0104	2353	1348	1524	0107	2356	0936	1114
15	0731	0912	1719	1900	0129	0309	1122	1301	0130	0312	1413	1550	0134	2246	1003	1141
16	0709	0849	1658	1837	0118	0259	1251	1433	0019	0157	1439	1620	0023	2314	0851	1030
17	0647	0828	1636	1815	0108	0248	1241	1422	0045	2334	1328	1505	0050	2338	0918	1057
18	0625	0805	1754	1935	0057	0237	1229	1411	0113	0252	1354	1532	2228	2405	0945	1123
19	0605	0744	1732	1912	0225	0407	1218	1400	0000	2250	1420	1601	2254	2432	0834	1012
20	0721	0903	1710	1850	0215	0356	1208	1349	0026	2315	1310	1446	2146	2321	0901	1039
21	0700	0841	1648	1828	0205	0346	1157	1338	0055	2342	1334	1513	2213	2348	0928	1107
22	0638	0818	1627	1807	0153	0335	1146	1327	0119	0300	1224	1401	2239	2416	0817	0955

	NOAA 12				NOAA 14				OKEAN 4				SICH 1			
	S'bound		N'bound		S'bound		N'bound		S'bound		N'bound		N'bound		S'bound	
23 May	0616	0756	1744	1926	0143	0324	1135	1316	0007	2256	1250	1427	2129	2304	0844	1023
24	0538	0738	1723	1903	0132	0313	1125	1305	0033	2323	1141	1315	2155	2331	0732	0911
25	0712	0854	1701	1841	0121	0302	1115	1254	0100	2350	1207	1342	2222	2358	0759	0938
26	0651	0831	1639	1819	0110	0251	1243	1425	0126	2237	1230	1408	2110	2248	0826	1004
27	0629	0810	1618	1757	0100	0240	1232	1414	0017	2303	1122	1256	2136	2313	0715	0853
28	0607	0747	1735	1916	0229	0411	1221	1402	2151	2330	1148	1322	2204	2341	0742	0920
29	0726	0906	1713	1854	0218	0400	1210	1352	2218	2356	1214	1349	2052	2229	0809	0947
30	0704	0844	1652	1832	0207	0348	1200	1341	2246	2422	1103	1237	2119	2256	0658	0836
31	0642	0822	1631	1810	0157	0337	1149	1329	2133	2310	1129	1304	2144	2324	0724	0903
01 Jun	0620	0800	1748	1928	0146	0327	1138	1319	2159	2338	1155	1330	2035	2212	0752	0930
02	0559	0738	1727	1906	0135	0316	1127	1308	2227	2403	1044	1218	2102	2239	0640	0818
03	0716	0857	1705	1845	0124	0305	1117	1257	2114	2252	1110	1245	1952	2127	0707	0845
04	0654	0836	1643	1823	0114	0254	1246	1427	2140	2318	1134	1312	2017	2154	0734	0912
05	0635	0813	1622	1801	0102	0243	1235	1416	2207	2344	1025	1200	2044	2221	0623	0802
06	0613	0751	1739	1919	0231	0413	1225	1405	2055	2235	1051	1226	1935	2109	0650	0828
07	0730	0910	1718	1858	0221	0402	1213	1354	2122	2300	1117	1253	2001	2138	0717	0855
08	0707	0848	1656	1835	0211	0351	1203	1343	2149	2326	1006	1141	2027	2204	0606	0744
09	0645	0826	1634	1814	0159	0341	1152	1332	2036	2214	1031	1207	1918	2053	0633	0811
10	0624	0804	1752	1933	0148	0330	1142	1321	2103	2240	1056	1234	1945	2120	0700	0837
11	0603	0743	1730	1911	0138	0318	1130	1310	2130	2306	1122	1301	2010	2147	0548	0727
12	0721	0901	1708	1849	0127	0308	1120	1259	2017	2155	1012	1149	1900	2035	0616	0753
13	0658	0839	1647	1826	0116	0257	1249	1431	2043	2221	1037	1215	1927	2102	0503	0642
14	0637	0817	1626	1805	0105	0246	1238	1419	2110	2247	0927	1104	1951	2131	0531	0710
15	0616	0756	1743	1923	0235	0416	1227	1409	1958	2136	0952	1129	2018	2159	0558	0735
16	0556	0734	1721	1901	0224	0405	1216	1358	2025	2202	1020	1156	1907	2045	0448	0626
17	0712	0852	1659	1840	0213	0355	1205	1346	1914	2050	1043	1226	1934	2112	0514	0653

visible light frames from American NOAA orbiters. Modes 17 and 19 also decode NOAA signals, but produce twin images, with the visible and infrared frames side by side on screen. Many of the other modes are vacant, and can be edited by the experienced user to cater for other satellites.

Changing acquisition mode is accomplished from the Parameter Window. For modes 0-9, just press the appropriate numeric key; for modes 10-19, depress the Alt key then a number key. For example, ALT+7 equates to mode 17. A word of warning though! If JVFAX has already locked on to an incoming satellite signal, these keys become disabled, so to change mode you have to briefly disconnect the input to the JVF interface, select the new mode, then re-connect.

Tone-burst Synchronisation

All the modes relating to NOAA and Meteor satellites are already set up for optimum reception with the APT squelch operative. This means that JVFAX starts writing the image to screen only when it has achieved synchronisation with the tone-burst at the start of each line of the transmitted APT signal. It is this tone-burst which produces the familiar vertical lines that appear in the margins of weather satellite images. It is also responsible for the peak white component shown in the histogram display, and which triggers image capture.

There are four squelch modes related to tone-burst signals; METEOR for the two Meteor modes, NOAAVIS used by default for the two NOAA modes, and NOAAALL used with the two twin-image NOAA modes. The fourth, NOAAIR is not used in any of the default modes, but can be substituted for NOAAVIS if only the infra-red frame is required. These are displayed immediately to the right of the phasing (Ph) option in the Parameter Window, and may be toggled by pressing the <N> key. This is the easiest way to substitute the NOAAIR synchronisation for NOAAVIS. But be warned; if you set an incompatible squelch mode such as METEOR for a NOAA satellite, decoding will be suppressed.

Saving Images

By default, JVFAX contains a directory named PICS, inside which it saves its images as GIF files (or TGA files if you are using JVFAX v 7.1). There are two options for saving images. One is simply to allow an image to build on screen, and, on conclusion, press the function key <f2>. You will be prompted for a filename, and the image is saved. But note that this will save only what you actually see on screen. A complete satellite pass takes up more than a full screen, and you will notice that the screen scrolls once the image is too big to fit. If you wish to save the entire transmission, you must press function key <f3> while the Parameter Window is displayed, and before acquisition commences. You can now leave JVFAX running all day while

you are out at work, and each successive satellite pass will be saved automatically under filenames JVFAX001.GIF, JVFAX002.GIF . . . . . for you to examine at your leisure when you come home in the evening.

Summary

There is no doubt that JVFAX coupled with the JVF decoder makes a superb system for producing weather satellite images. Perhaps its greatest attraction is the facility for unattended satellite acquisition over an extended period, which should appeal to those of us who have to work most days of the week.

Although this article does little more than scratch the surface of its capabilities, it should provide a relatively painless guide to getting started. Once you have the confidence to use the system, it will be no time before you start delving into the JVFAX manual and setting up your own satellite configurations (for Okean for example), getting to grips with the automatic scheduler in order to capture different satellites automatically etc. etc. The more you study the documentation, the more you will discover about this truly fascinating system.

ATTENTION LINDENBLAD USERS

John Tuke

For long distance reception of weather satellites in the 137MHz band, there is little to beat the Lindenblad aerial. It does have the drawback of having no response from directly overhead but it is easy enough to change over to a simple crossed dipole for high elevation reception. From the physical point of view, its one serious weakness is the half-wave lines made up from 300 ohm ribbon. If you pull these taught they break at the ends and if you leave them slack then they flap in the wind and eventually break off. They are not impervious to moisture either as I have experienced rainwater running down *inside* the plastic ribbon and rotting the copper; acid rain I suppose.

A little experimenting with my all-singing, all-dancing Japanese calculator showed that 300 ohm open line could easily be constructed using 18-guage tinned copper wire and the small plastic screw connectors sold in blocks of 12, which used to be known as 'chocolate-block connectors' in the days when they were made from brown plastic. Now they are made of polythene or something similar. They come in various sizes and those with 3/8 inch (10mm) spacing are the ones to use.

The line so constructed can be screwed to the mast and also pulled moderately tight, making a strong, weather resistant job. The electrical result also seems to be an improvement as I now find that my pre-amplifier, which is close to the aerial, tunes far more sharply than before, indicating a higher aerial 'Q'.

REAL (MSF) TIME

Bryan Taylor

Much has been said and written on the matter of the PC and its timekeeping, or rather the lack of it! Ever since I installed my PROsatII card I have been all to well aware of the problems it can cause, particularly when trying to put a grid on to an image. I looked at a number of programmes designed to keep the internal clock somewhere near the truth. Most reduced the problem but still left inaccuracies.

During the search I came across a programme known simply as "MSF". This is a 1k TSR which takes the 60 kHz MSF transmissions from Rugby off air and continuously updates the internal clock. TSRs do have a reputation for generating problems but I thought it might be worth a try. A MSF receiver kit (Cirkit 40-06002) was constructed and connected to one pin of a spare games port as detailed in the very good "readme" file using a single transistor circuit (fig. 1). The results have been very impressive; working for nine months without TSR problems and maintaining accurate time.

There are two versions of the programme, MSF and MSFUTC. The former maintains UK time, adjusting for Summer Time as necessary while MSFUTC keeps the clock on UTC which is very useful for gridding images.

How do you know that the time is correct? The correct positioning of grids on images is a good indication but, in addition, I use a very useful MSF clock from the INDEX catalogue (Order code 220-664). What makes this one special, apart from its very reasonable price, is that it is the only model I have found that displays seconds as well as hours and minutes. In my local branch these clocks are known as "those funny clocks" - apparently because they have no way of adjusting the time!

Because I got the arrangement working very easily I have very little experience of fault finding but if you give it a go and run into problems I would be happy to discuss them with you. (Tel. 01473 726667). I would also welcome any comments or details of problems solved which I might be able to pass on to others.

Les Hamilton has kindly made the software available through the RIG Shareware Library. ⊕

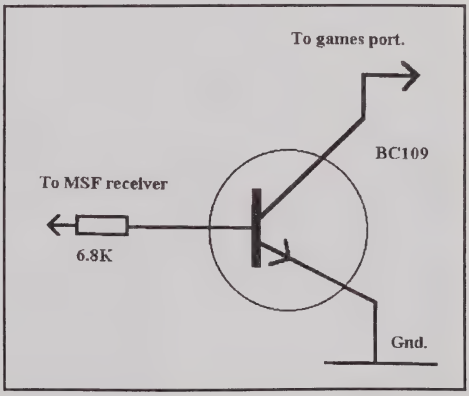


Figure 1

INTERPRETING WEATHER SATELLITE IMAGERY - PART 13

Peter Wakelin

Throughout this series I have made little or no mention of channel 3 imagery from the NOAA satellites. The APT transmissions can broadcast only two images simultaneously and they are normally the thermal infrared channel 4 and the 'visible' channel 2 during the daytime part of each orbit. As the satellites cross into the night side of the Earth, channel 2 is replaced by channel 3 which operates at around 3.7 micrometres. Strictly, channel 2 should not be called 'visible' as its bandwidth extends off the red end of the visible part of the spectrum into the near infrared but it is generally referred to by this name. Figure 1 shows the spectral ranges of the 5 channels on NOAA 14.

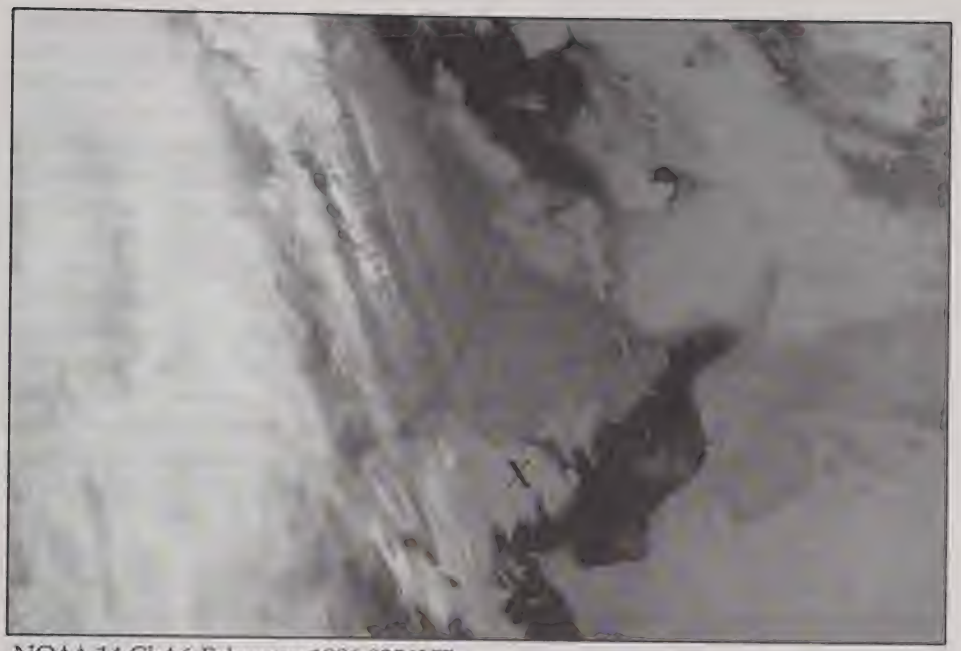
Spectral Bands (in micrometres)	
Ch1	0.58-0.68
Ch2	0.72-1.10
Ch3	3.55-3.93
Ch4	10.3-11.3
Ch5	11.5-12.5

Figure 1

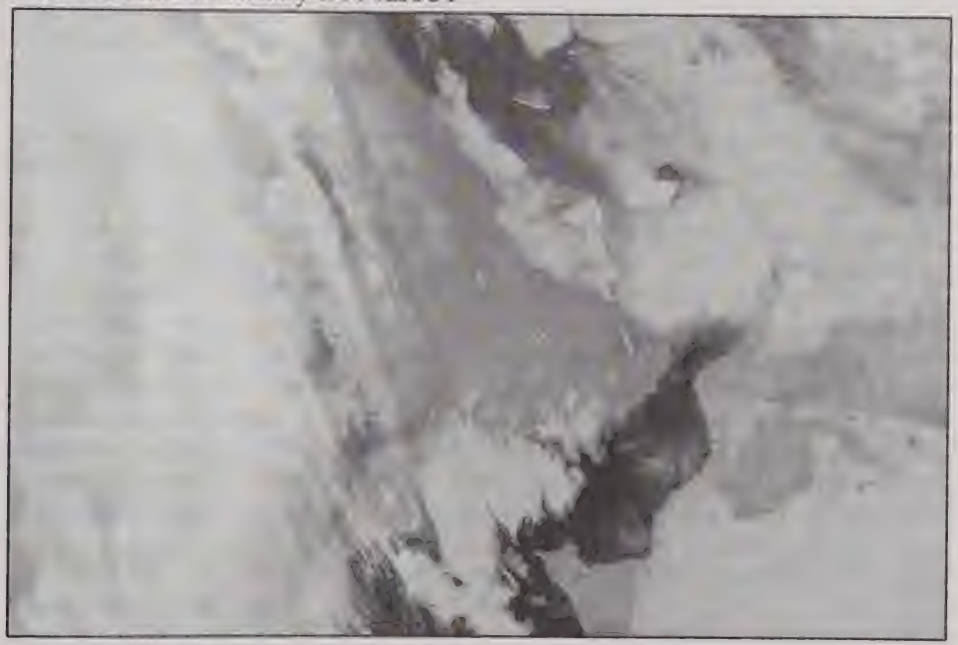
Channel 3 data from the current series of NOAA satellites has been plagued by interference problems caused by other equipment on board the satellite and this has shown up on the images as a pronounced pattern, usually in a 'herring-bone' form. This problem has been largely, but not entirely, overcome on NOAA 14. In RIG 37, June 1994, Michael Gill briefly described the characteristics of the images from each channel and showed how to identify the channels in use from the APT edge-code. Because of the rather poor 3.7 micrometre images in those days, he described channel 3 as "...the channel that no one pays much attention to..." The time has come to change that. There is one drawback though; nightime passes of NOAA 14 occur at rather unsociable hours. For example, a place at 50N passes through the orbital plane at about 0230 local time.

The interpretation of our images is very complicated because the radiative properties of objects depend not only on their physical properties but also on the wavelength. For channels 1 and 2 there is virtually no emitted radiation from clouds or the surface; the detectors sense only reflected sunlight. In the thermal infrared channels 4 and 5, both the Earth's surface and clouds emit radiation almost like a perfect 'black-body' and there is almost no reflected radiation from the sun at these wavelengths. This enables the brightness of an object to be interpreted, via calibration tables, as a true temperature. However, at the 3.7 micrometre wavelength of channel 3, things are not so simple. Although the surface and ice clouds have emissivities close to unity, ie they behave like black bodies, clouds composed of water droplets behave differently and have emissivities around 0.8, or lower for thick clouds, at this wavelength.

At this point it is worth reminding readers about water and ice clouds. There is no law compelling water to turn to ice when its temperature falls to zero Celsius, though



NOAA 14 Ch4 6 February 1996 0256UT



NOAA 14 Ch3 6 February 1996 0256UT

in our more familiar environment it generally does so. Super-cooled water droplets can exist in clouds to below -30C and above about -10C, clouds are likely to consist almost entirely of water droplets. Snow usually falls from clouds which consist predominantly of water droplets. The change from water to ice can sometimes be observed on days when there is vigorous convective activity. When large cumulus clouds force their tops up into the higher, colder atmosphere, their rounded, sharp-edged features become rather diffuse and fibrous in appearance as ice crystals become predominant.

It follows from the above that over most of the world and throughout most of the year, low-level clouds will consist of water droplets. The effect of the lower emissivity of water droplet clouds on the channel 3 images is to make them appear brighter than a land or sea surface at the same temperature. Even in this hi-tech era, fog and very low cloud still create havoc for aircraft and other forms of transport but it should be possible to detect fog on channel 3 images which cannot be seen on channel 4 because the tops, being low, are at a similar temperature to the adjacent fog-free land.

The images reproduced here were received from NOAA 14 at 0256UT on 6 February 1996 and show England, Wales and northern France mostly clear but with a few significant areas of cloud. Ireland, Scotland and the extreme west of Wales and SW England are enveloped in high topped, cold, frontal cloud which, at the eastern edge, is thin enough to show surface features through it. The water of the English Channel is relatively warm and shows as almost black on both images.

For the purpose of this exercise, I have not selected images which portray fog in case the limitations of the printing process make the small differences in grey level indiscernible in the final product. Let's consider instead the uniform grey patch of cloud marked with an 'X' north of the Cherbourg peninsula which partly covers both the sea and southern England. On the channel 4 image, the cloud temperature at point 'X' measures at -12C whilst adjacent to it, the land is at -5C. The sea measures at 7C, which seems a very realistic value for the time of year. This cloud temperature indicates that the tops at this point are probabably near to 1500m; mucher higher than fog, which is typically around 500m. Moving to the channel 3 image, the temperatures at the same points show as -17C for the cloud and -5C and 7C for the land and sea respectively. The sea and land record the same temperature on both channels but obviously the cloud droplets at the top of the layer can have only one physical temperature. The value from the channel 3 sensor, which should really be called the 'brightness temperature', is lower because, as stated above, water-droplet clouds do not radiate as a black body at this wavelength.

In the case of fog, with tops only a few hundred metres above the ground, the temperature difference between cloud top and adjacent ground would be too small to

show as a different grey level on the channel 4 image, but the 'brightness temperature' difference on the channel 3 image would be several degrees, perhaps 5 degrees as in this case, rendering the fog discernible.

HRPT users have access to channel 3 data during the daytime as well, but 3.7 micrometer radiation reflected from water-droplet clouds can often more than compensate for the lower temperatures and render cloud a darker grey than adjacent ground. These channel 3 daytime images are extremely difficult to interpret, which is probably why NOAA is to add an additional channel 3A and rename the present 3.7 micrometre channel 3B with effect from NOAA 15. 3A will operate at a narrow band centred on 1.6 micrometres during the daylight part of the orbit, then 3B will be switched in for the other half of the orbit. This additional wavelength has been used on other imaging spacecraft for some time and its characteristics are well known. More about that after NOAA 15 is successfully orbited. ⊕

GATWICK AREA RIG REGIONAL GROUP

John Boyer G0WRX

The Gatwick Area RIG Regional Group met at the Cherry Tree in Copthorne for the first time on Saturday 3 February. The attendance was poor despite the notice in the December journal.

There were very informal discussions on a variety of topics ranging from interference to the design of home-brew HRPT systems. Peter Wakelin brought along some very nice prints of Okean and Sich images and John Green showed some prints of images which he had decoded using his home-brew APT system. At the heart of his system is a proprietary DSP card.

On the subject of interference, John mentioned that he possessed an inter-digital filter which we felt could be tuned down to 137MHz. He does not have the equipment to do this so is going to pass the filter on to me shortly. If it helps with pager interference we will look into 'cloning' it and passing the information on.

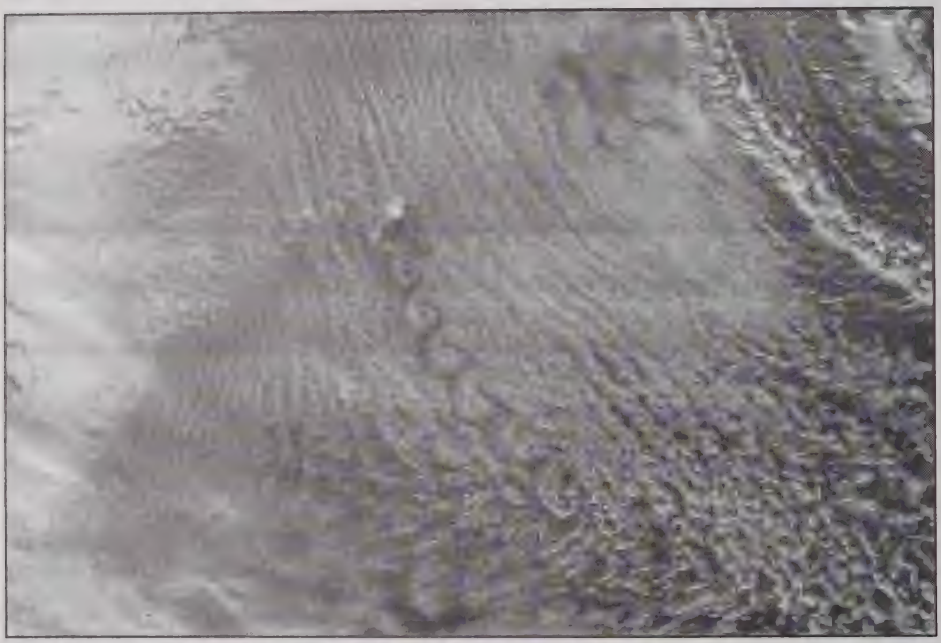
On the HRPT front, we are confident that we can produce a cheap PC interface card. We could reduce considerably the component count and keep costs down by utilising a FPGA (programmable logic chip). As always with these things, we have the expertise between us but have we got the time? A larger pool of people would certainly help (hint).

The Gatwick Area RIG Regional Group will meet again at the Cherry Tree, Copthorne, at 1300 BST on Saturday 13 April.

[John Boyer's telephone number appears on the Helpline page. Ed] ⊕

RE: KNOTS IN THE SKY

Several people responded to my request for more information on the mechanism causing the cloud formations downwind of the Cape Verde islands which were illustrated in the December journal (page 79). Extracts from reports by an engineer, Matthew Ambler and a meteorologist, Bernard Burton are reproduced below. Dr Paul Ruscher of the Department of Meteorology at Florida State University referred me to a paper he published with JW Deardorff in 1982 in Tellus, 34, 555-566 entitled " A numerical simulation of an atmospheric vortex street". Finally, John Tellick sent me an image, which is reproduced here, from Meteor 3-4 which shows a fine series of vortices downwind of Jan Mayen island off the east coast of Greenland. My thanks to them all. Ed.



Jan Mayen vortices. Meteor 3-4 1424UT 27 March 1992

Von Karman Vortex Shedding
Matthew Ambler

The image on page 79 of the last issue does indeed seem to portray a typical 'von Karman vortex street' caused by the 'shedding' of vortices from a 'bluff' body of some shape or form.

The Boundary Layer

This layer is a very important concept in fluids (ie liquids or gases) and it refers to the thin layer of a fluid close to a stationary object which, in general, has a very low velocity relative to the clear stream velocity. This reduced velocity is due to friction (which is dependent on the kinematic viscosity of the fluid and the coefficient of friction of the object) between the fluid and the stationary object.

The Mechanism forming the Vortices

In the case of a streamlined object the boundary layer remains 'attached' to the object and only 'detaches' at the last moment. A 'bluff' body, by its nature, presents a very difficult object for the boundary layer to remain attached to. The early detachment of the boundary layer allows small vortices to form downstream of the bluff body which 'roll up' into the low pressure region behind the bluff. This process alternates (first one side then the other) due to pressure changes behind the bluff whilst one vortex is developing. The wake produced by this alternate vortex development and shedding is known as a von Karman vortex street which has the characteristic pattern seen in the image.

In a controlled environment the frequency at which the vortices become detached from the bluff body can be related to the velocity of the fluid passing the bluff body. This forms the basis for a range of meters for measuring fluid flow which, unsurprisingly, are known as vortex shedding flowmeters.

In general, any non-streamlined object is likely to form vortices in a flow stream and some of the civil engineering world's most infamous failures have been caused by uncontrolled vortex shedding. If the frequency at which shedding occurs just happens to match the natural frequency of an object, the structure begins to resonate and may eventually shake itself apart. The classic case of this is the Tacoma Narrows bridge in the USA. Many tall, cylindrical chimneys are fitted with helical flutes which, in addition to stiffening the structure, prevent the formation of possible catastrophic vortices by diverting the airflow around the chimney.

Von Karman Vortices
Bernard Burton

The conditions conducive to the formation of von Karman vortex streets are:

1. Isolated or well spaced islands having significant topography and situated in an oceanic setting.
2. An atmosphere characterised by a marked stable layer situated below the level of

the highest topography.

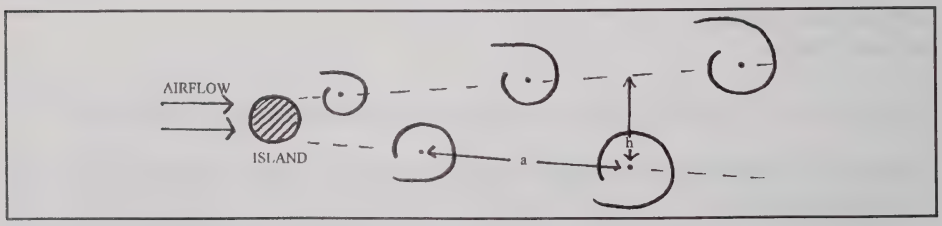
3. A moderate airflow which is fairly constant in time and is fairly straight and undisturbed for a considerable distance upwind of the island.
4. For the vortices to be visible, sufficient moisture must be present below the stable layer to produce cloud.

Several places on the globe are known to produce the phenomenon. Locations visible on satellite images received in the UK are Jan Mayen, Madeira, The Canaries (especially Tenerife and Grand Canaria) and the Azores.

Vortex streets may frequently be seen to the southwest of the Canaries and Madeira because the requisite atmospheric conditions are most frequently met in this area. The dominant wind direction is from the northeast and air subsiding (descending) as it circulates the semi-permanent Azores anticyclone is prevented from reaching the surface by an active convective boundary layer (the layer in contact with the surface). This convection distributes the heat and moisture in the vertical but cannot penetrate far into the descending air above, which has been warmed by compression.

When this type of airflow encounters an obstacle which occupies the entire depth of the boundary layer (a few hundred metres), it finds it easier to flow around the obstacle than over it. This produces an enhanced airflow on the flanks and a stagnant region to the lee of the obstacle. Vorticity, which is a measure of horizontal wind shear (change with distance), and curvature in the flow, is thus available for the generation of a vortex.

It is found that vortices are generated on both sides of the obstacle and are shed into the flow alternately. There are certain common parameters of the vortices: The scale is initially close to the diameter of the island but tends to increase as they move downstream. A pair of vortices is shed typically about every 8 hours and may persist in the flow for up to one and a half days, travelling up to 1000km. The speed of movement is usually about three quarters of the speed of the flow in which they are embedded. The rotation of vortices is in the same sense along one row but is opposite to that in the other row.



Schematic diagram of vortex streets.

For Gran Canaria, which is 20km wide and 1950m high, a = 132km and h = 51km. The ratio h/a = 0.39 is typical and is found to lie between 0.3 and 0.6 in all cases.

A more complete discussion of vortex streets may be found in Meso-scale Atmospheric Circulations, BW Atkinson, Academic Press 1981, Ch4. ⊕

A NEW METEOSAT IMAGE COLLECTION ON CD-ROM

The European Space Agency has issued a double CD-ROM containing over 32,000 Meteosat images received between 1 July 1994 and 30 June 1995 entitled Meteosat Collection No. 3. Subtitled Europe's Four Seasons, the vast majority of the images are of the "top centre" part of Earth's disk as seen from Meteosat. The image reproduced here shows the area covered.

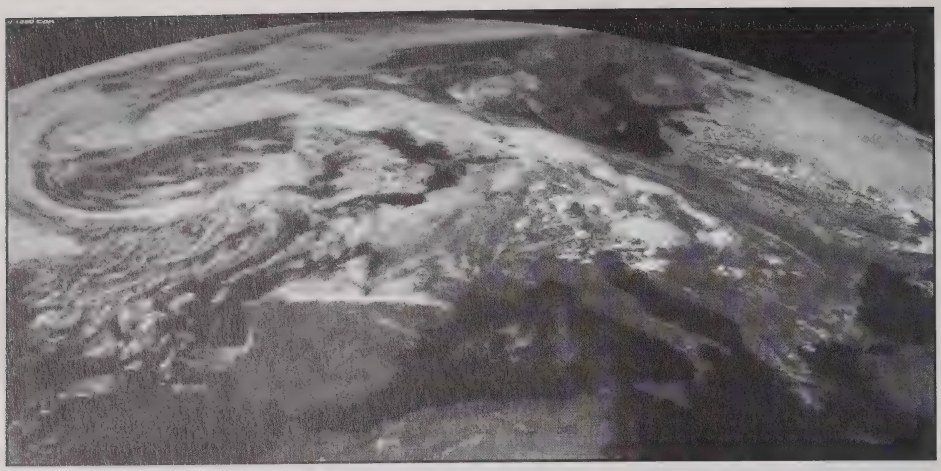
Included on the CD-ROMs are: all infrared images collected every 30 minutes through the year, one water vapour image hourly and 17 half-hourly visible light images per day centred around midday. The visible light images have been sampled in order to provide the same resolution (5km) as the infrared images. One full resolution (2.5km) visible light image per day, taken at noon, is also included.

A Wavelet Transform compression method has been used to store more than 14 gigabytes of data on the two disks. After decompression the quality of the images is perfectly adequate for numerical derivation of meteorological products. All calibration data are included.

Windows is required and a 486 or Pentium processor is recommended. The decompression software is included and is simple to operate; just tag the images and formats you require from the "thumbnail" images displayed, click on Decompress, then go and make a cup of coffee. With a 100MHz 486 processor several minutes per image are required. It has been tried on a 386 and is quite satisfactory but buy another jar of coffee. Images are decompressed onto the directory of your choice on your hard disk in .RAW or .BMP formats for viewing and processing in your favourite software package.

A few full disk Meteosat images are included as is one full disk GOES 8 image at high resolution. An interesting addition is the inclusion of monthly loops of reduced resolution European images. Watch a month's weather pass by in a minute or two; it is not only fun but is useful to locate particular weather patterns. Britain's early hot and sunny spell in late April 1995, for example, shows up well.

Finally, a word of warning: These images are taken from the high resolution digital data and, although not quite up to the standard of direct PDUS reception, will make



WEFAX users realise just how inferior their analogue images are. The two-disk set is available from RIG for the same price as the earlier Meteosat collections. A few copies of the second collection CD-ROM are still available. See Shop Corner for prices. PW.

GALILEO UPDATE

7 December was the big day and everything went perfectly. Galileo's engine was fired to slow it down and permit Jupiter to "snatch" it. The spacecraft is now successfully in orbit around Jupiter and a busy two year period lies ahead. On the same date at 2204UT, the probe, which separated from Galileo last July, ploughed into Jupiter's upper atmosphere at a speed of 170,700km/hour - by far the highest speed ever attained by a human-made object. Friction with the Jovian atmosphere raised the probe's surface temperature to twice that of the Sun's surface and the peak deceleration forces were measured at 230g (230 times the acceleration due to gravity at the Earth's surface).

All instruments aboard the probe survived the entry phase and data were transmitted to Galileo, 200,000km above, for 57 minutes of the parachute descent. During this period the probe penetrated a further 156km into the gas giant before succumbing to the intense heat and pressure.

Preliminary findings from an analysis of early probe data indicate less water and less oxygen than anticipated. Unexpectedly low levels of helium, neon, carbon and sulphur were also measured. Lightning levels were very low too but winds were around 50 percent stronger than anticipated at up to 500km/hour.

WORLD WEATHER HIGHLIGHTS
November 1995 - January 1996

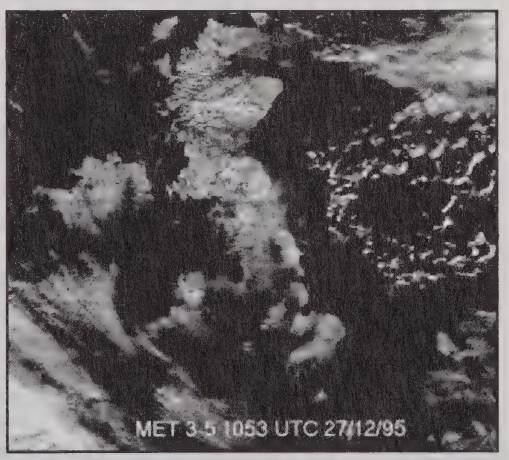
Typhoon Angela update (see last issue): Sustained winds reached 150kt shortly before landfall in the Northern Philippines making it the strongest typhoon to strike the area since Agnes in 1984. The death toll rose to 700.

In mid December, the city of Buffalo, New York, recorded 900mm of snow in a single day. In spite of timely and accurate forecasts, the "Blizzard of '96" paralysed large parts of the northeastern USA in early January. Level snow depths in excess of 600mm were recorded in places. Later, heavy rainfall and melting snow resulted in serious flooding.

600mm of rain fell on the Santa Catarina coast of southern Brazil in late December with 315mm in a single day. Severe flooding killed more than 50 people with thousands losing their homes.

Late December saw much of Britain under snow for several days. Snow amounts were the highest for 10 years or more in the far north with the Shetland Islands particularly badly affected. At Altnaharra, in the far north of mainland Scotland, the temperature fell to -22 on 28 December and two days later, the same site recorded a new UK record low of -27.0. Dennis West received this good image of snow-covered Britain on 27 December. Much of Britain, especially southern England, experienced very low amounts of sunshine in January. Long-standing records were broken with some stations reporting as little as 25 percent of the long term average sunshine totals.

Tropical cyclone 3B formed southeast of the Nicobar Islands on 5 November, reached the Orissa coast of India 4 days later as its winds reached hurricane speed, then turned north and weakened. November is normally a dry, fine month in Nepal and is the peak month for tourism. The cyclone carried vast quantities of moist air into the Himalayas with disastrous consequences. Heavy rain affected the lower parts but up to 2.5m of snow fell in the elevated Khumbu region of Nepal. The resultant avalanches killed over 60 persons, many of them Japanese tourists. ⊕



INTERNET NEWS

I plan to use this spot primarily to post information and URLs of interest to the increasing number of members who have Internet access. Anyone who finds anything which they think would be of interest to others is invited to e-mail the editor with details.

It seems highly probable that we will have to move our World Wide Web page from its present location on a BBC server. Hopefully, we will be able to announce details of alternative arrangements on our web page before it closes. The URL of our site is http://www.bbc.co.uk/john_wxpics/rig/index.html

It is reported elsewhere in this issue that WEFAX from GOMS is imminent so it will be worthwhile monitoring the following for the latest news: http://smis.iki.rssi.ru/goms_2.htm

Imagery from the new Canadian Radarsat is available at: http://www.ccrs.nrcan.gc.ca/

ccrs/radarsat/rsate.html

Spot Image's home page leads to some nice images. Try http://www.spotimage.fr/

There's an interesting selection of pointers to other URLs from the Remote Sensing Society's site. http://www.geog.nottingham.ac.uk/rss/index.html

Not all high quality imagery comes from spacecraft costing hundreds of millions of pounds. Several microsatellites with imagers costing just a few million are up there with their big brothers. This image of Kuwait and environs came from PoSat-1 and is reproduced here with permission from Surrey Satellite Technology Limited (SSTL). PoSat-1 is an experimental technology demonstrations and scientific microsatellite based on the UoSAT-bus and was procured by a consortium of Portugese companies from SSTL. It, and six other microsatellites, were launched along with SPOT 3 by an Ariane launch vehicle at 0140UT on 26 September 1993 from Kourou, French Guyana. More images from PoSat and other microsatellites are available from http://www.ee.surrey.ac.uk/ where a new image is added every week.

Many members have expressed interest in images from the Hubble Space Telescope. They are now available in the UK without having to access the congested STScI server. Try http://www.ast.cam.ac.uk/HST instead. ⊕

RIG REGIONAL MEETINGS

Frank Bell

I am still keen to promote the establishment of regional meetings. We seem to have three established so far with the Isle of Wight hosting one and another centred on Bristol. I would very much like to see reports of these meeting so that your committee can monitor progress and decide how best to support regional meetings. A third has very recently been formed by John Boyer in the Gatwick area.

I was very pleased to receive a letter from Douglas Deans in Scotland. He is keen to establish a group and is suggesting somewhere in central Scotland to attract members from as wide and area as possible but close enough to the major population centres of Glasgow and Edinburgh. If you are interested, then get in touch with Douglas Deans, 17 Montrose Way, Dunblane, Perthshire, FK15 9JL, or telephone him on 01786 822828. ⊕

AR3000A MODIFICATIONS FOR WXSAT RECEPTION

Graham Smith, GIJVZ, informs us that the March 1996 issue of Ham Radio Today contains details of an upgrade to the AR3000A receiver which makes it more suitable for WXSAT use. ⊕

MEMBERS' LETTERS

Dear Editor,

I often read of complaints about computer generated noise affecting live reception. This is generally due to incorrect installation of the equipment and a little thought on the subject will solve the problem. I use a five year old Dartcom receiver only about a metre from two computers and experience no problems at all.

However, there are rules to be followed; the first is that the receiver and coaxial cables must be bonded to a true earth. Secondly, the very best quality coaxial cable must be used; mine is all the thick stuff from Westlake and is cut to a multiple of the wavelength ie, a tuned length. The simple circuit from John Tuke in the September 1995 issue, I regard as a matcher as it is important to tune the antenna, whether transmitting or receiving.

The power-pack should have an electrostatic screen fitted and the audio signal cable from receiver to computer should be of the low noise type. Find a position for the receiver where any interference is lowest; you will find this distance is related to the receiving wavelength.

There is no single cure-all fix for the computer interference problem but by observing several simple rules almost total immunity to interference can be achieved.

Yours truly, S. Dutton, 40 Grafton Road, Harwich, CO12

Dear Peter,

Your comments in the December journal (letters, page 67) call, I feel, for a response. I believe that the IBM PC and its derivatives have become the World standard because the majority of producers saw the benefits in simple monetary terms. Whilst I would agree that the PC is remarkably good, both for value and in its technical abilities, other computers provided better facilities earlier and more often. However, having got a standard it is worthwhile developing it and software producers were the ones who pushed the PC standard for all it was worth. It is an accepted fact that software for PCs is the most widely available bar none. Unfortunately, the same headlong dash for a simple one off system is leading users now into the "Windows" fold.

Again, software producers are going at full speed to support Windows to the exclusion of all else. This is not in the best interests of users.

The comparison with video recorders is good; the Betamax is by far the better system (witness the fact that all professionals now use it for news gathering) but VHS won because the majority of shops found that VHS was cheaper to sell and to rent. Therefore, VHS became the only system available, no one wanted to support Betamax and the same could happen to DOS and to other computer operating systems.

There may, in a few years' time, be only one computer operating system - Windows. This would, I believe, be catastrophic. We could all be held to ransome by one producer. So far there is a choice and everyone should be on their guard to ensure such a choice continues to be available.

Best wishes, Colin Goodall, Stoneway, Hazleton, Gloucs.

Dear Peter,

I received this image from Meteosat 5 at 2127Z on 29 November 1995. It is an infrared image of sector D8 which the southern Atlantic Ocean and part of the coastline of Southwest Africa.

I can assure you that I have made no enhancement or otherwise interfered with the image and you will readily see that it is a picture of a witch hurtling across the South Atlantic. The features of her head are clearly visible with her long, white hair streaming behind.

Yours sincerely, Ted Brooks, GD4HOX, Elmwood, Somerset Rd, Douglas, Isle of Man, IM2 5AE. ⊕

SHAREWARE CORNER

LES HAMILTON

There are two major new shareware offerings this quarter; Satspy, a brand new satellite tracking program, and SEA, a very fast DOS image viewing program. There are also reviews of significant upgrades to a number of established favourites.

While on the subject of image viewers, it is worth noting that support for the GIF format is on the decline. After many years of allowing free use of the LZW compression routine used in GIF format images, Unisys Corp. (which holds a patent on this process) has decided to assert its rights to royalty payments from software authors creating and selling new products that display or save GIF images. Members with a copy of NEOPAINT v 3.1 or JVFAX v 7.1 will realise that these programs no longer support the GIF format.

The upshot is that many program developers have largely decided to abandon GIF completely and replace it with a new copyright-free, lossless compression format called Portable Network Graphics (PNG). The versions of SEA, Compushow, Graphics Workshop and QPV offered this quarter already support PNG. Image files of any colour depth may be saved as PNG files and the compression algorithms used actually produce better compression that GIF. If all the hype is to be believed, PNG could well become one of the most popular compressed image formats.

I have taken the opportunity of giving the Shareware Library a Spring Clean. Some older material has been removed but most of the reorganisation has been to cope with the increasing size of upgraded versions of well established programs, most particularly those in the graphics and satellite tracking sections.

Finally, I am still without any luck in my attempts to register PHOTOLAB after four months. It is a superb program, and as far as I am concerned, the fact that no-one appears to want my money is not going to stop me using it!

Satspy (SATSPY10)

This is a new program which runs under Windows but requires at least a 386 machine, and a maths co-processor to function successfully. Satspy features a highly graphical, menu-driven interface which offers the options of tracking satellites either by viewing ground-tracks superimposed upon the Earth, or by plotting their paths across the heavens. Satspy allows you to predict where and when to look to actually see an orbiting satellite as seen from your own location. The <Orbit> menu can display the ground-track of a selected satellite on either a Mercator or spherical

map of the Earth. The <Star View> menu similarly displays the path of the satellite against a background of stars and constellation outlines, with the choice of RA/dec map or a local sky view. These tracks run for one complete orbit from the time of selection. Each track is displayed in its own window and a number of windows may be displayed on screen at the same time, neatly arranged using the <Windows - tile> menu. Each window supports a floating menu, which appears on pressing the right-hand mouse button over it. These menus offer facilities to zoom in, update current time to advance the satellite's position and display tables of data (time/azimuth/elevation/range etc.) on the satellite pass at 15 second intervals. The 3D ground-track option also supports automatic updating of the satellite's position.

Satspy utilises files of Keplerian elements in NASA 2-line format, bearing the extension .ELS (e.g. TWOLINE.ELS) and has filters to enable selection of particular types of satellite by means of such properties as inclination, period and age of the elements. Satspy is a fascinating program, boasting many features over and above those described above, and will provide hours of entertainment to both the serious satellite spotter and those with a casual interest in astronomy. It even lists the visual magnitude of satellites for the benefit of those searching the heavens for them. The program carries a registration fee of $39.95. [Disk T-03]

MSF

This is a small memory-resident (TSR) program that enables your computer to update its clock by decoding data received from the MSF (60 kHz) transmission from Rugby, thus setting it's date and time very precisely. Data is supplied via a suitable MSF receiver into a free port on the computer. Bryan Taylor has been extolling the virtues of MSF and has written a short piece about it elsewhere in this issue. [Disk U-04]

SEA v 1.0 (SEA10)

SEA is a new graphics viewer originating from Holland. Although a DOS program, it has a most elegant graphical user interface reminiscent of Windows, and is truly a delight to use. The authors claim that SEA is the fastest VESA compatible mouse controlled viewer/converter around (a VESA compatible graphics card is essential and a 386SX is the minimum machine specification). Among the many image formats it can view are the popular BMP, GIF, JPEG, PNG, TARGA, TIFF, and PCX. SEA can also play FLI and FLC animations and is claimed to be able to accomplish conversions between all listed graphical formats. In practice, I found this option unpredictable. Sometimes conversions worked well but on other occasions, for no apparent reason, nothing happened. Nevertheless, SEA is a brilliant and extremely fast image viewer despite this shortcoming and is without doubt at the forefront of its genre.

All the program's options are user definable by pressing the f3 key, and clicking with the mouse on appropriate buttons. Images can be inspected in a preview window before being viewed full screen, while images larger than the screen can be panned by use of the mouse. There is also a useful catalogue option which creates screens of reduced preview images, which can be saved as a reference library.

Future developments promised include MPEG, VOC and WAV file support as well as image manipulation and filtering, which could make SEA one of the most comprehensive image manipulation programs available. Registration is 35 guilders (Dutch) or $24 US. [Disk V-02]

UPGRADE NEWS

QPV v 17A

This is QPEG by a new name, reflecting the fact that its functionality now extends far beyond viewing files in the JPEG image format. QPV now reads JPG, TGA, GIF, PCX, BMP, IFF, PBM, PNG and Photo-CD images. Always one of the fastest image viewers around, its JPEG decoding routines have been improved again, yielding speed increases of about 25% on a 486 computer and 45% on a Pentium. [Disk V-01]

GWS4W v 1.1 T

Graphics Workshop for Windows continues to develop, and this latest version features noticeably reduced disk read and write times, particularly in the case of JPEG images. Additionally, the image quality for JPEG-compressed files has been improved while support has been added for the new PNG image format. The program has been designed to operate under Windows 95 and now possesses a graphic button bar with tips plus a switch to allow hidden directories in the main file selector. [Disk-GWS]

JVFAX v 7.1

If you are using JVFAX v 7.0, you will probably be happy to continue with it. As far as I can ascertain, the only difference between this version and its predecessor is that images are no longer saved in GIF format. Targa (TGA) files are now the preferred format for storing images, though GIF images can still be read by the software. This is yet another consequence of the licensing arrangements now relating to the use of GIF image compression. I can supply JVFAX71 on request if you wish a copy, but honestly, there is no real advantage unless you are a targa fan!

Compushow v 2.04

The main addition to this image viewer is the ability to interconvert formats. Once an image has been selected, the Mode Select menu includes 'Convert' as its final option. If you select this, you are faced with a menu of image formats; select one, and the new file is automatically saved to disk. An overwrite protection scheme prevents loss of existing images. In addition to support for the new PNG graphics format, Compushow will continue to support GIF images. [Disk V-01]

STS Orbit Plus v 9540 and PC Track v 3.11

Both these popular satellite tracking programs have been upgraded recently. There are no major improvements in either, though there have been cosmetic improvements and numerous minor bug fixes. [Disk T-06]

Traksat v 3.10

This version is a total revision of TRAKSAT which is much simpler to use and looks very slick. Remarkably, this new version has lower memory requirements than its forebears and will run happily on a computer with a 286 processor. Traksat now has a facility for saving its graphic screens as PCX files and has an additional 3D ground-track view. Finally, there is optional Auto Tracker support for antenna control and Doppler shift radio tuning. [Disk T-08]

Winorbit v 2.8

Winorbit now allows a secondary satellite position and footprint to be displayed on each of the maps, which can now optionally be displayed with lines of latitude and longitude turned off for creating cleaner screens for export. It is now possible to print mutual visibility prediction tables and Doppler shift and path loss can now be displayed for uplink downlink, or transponder delta frequency. The crash that used to occur when the Sun or Moon was selected while using non-USA date formats has been rectified. Calculations of EQX, AOS, and Apogee/Perigee for tables are now faster and more accurate, while maps now display AOS for the next satellite pass. Additionally, two-line element sets can be saved from the edited orbital elements. [Disk T-05]

MARCH ADDITIONS TO THE RIG PC SHAREWARE CATALOGUE

The following reviewed shareware is offered on the RIG 44 compilation disk.

Disk RIG44 SEA; SATSPY; MSF.

SHAREWARE TITLE CATALOGUE

Programs requiring Microsoft Windows are indicated by an asterix (*)

Disk A-04	*Earth Centred Universe v 1.5, Lunar Eclipse, Skyglobe v 3.6, Skyview, Solar Eclipse Predictor, Solar System Finder.
Disk A-05	*Skymap v 2.1 - Planetarium to display and print star charts etc.
Disk C-02	Hamcomm v 3.0, JVFAX v 7.0, Packet Monitor, RTTY_FAX, Satcom.
Disk F-01	CUTNOAA, DATtoPA2, JOIN-PIX, NOATIFF, CHOP, REJOIN.
Disk I-05	IMDISP v 7.9e, JPEG v 5386, Neopaint V 3.0,
Disk I-06	*Iphoto, *Lview Pro, *Photolab v 2.0.
Disk I-07	*Photovision Pro v 1.0.
Disk T-05	*Logsat v 3.0, *WinOrbit v 2.8, *Satspy v 1.0.
Disk T-06	PC Track v 3.11, STS Orbit Plus v 9540, Trackstar v 2.15.
Disk T-07	AOS, AOSUS, Bird Dog v 3.0, NOAATime, Predict, Sortneng, Spredict, Weather Satellite Tracker v 4.5k.
Disk T-08	Traksat v 3.10, *Wpredict v 2.63.
Disk U-04	Adjust Clock, BBC Time, PC Configuration v 7.33, Geoclock v 6.1, MSF, *RIG Index v 1.20, Screen Thief v 1.56.
Disk V-01	Compushow v 2.04, GIFEXE v 4.5, QPV v 1.7A, SVGA v 1.12, VPIC v 6.2.
Disk V-02	*GDS V 3.1g, PVE v 2.43, SEA v 1.0, *VUPRNT v 4.00.
Disk W-01	Weathr50, Windchill, WX-60, Weather Wizard.
Disk PSP	*Paintshop Pro V 3.0.
Disk GWS	*Graphic Workshop V 1.1T.
Disk Belmont	*Belmont Image Technician (sophisticated image processing suite)

If you require more information about any of these shareware programs, please consult the program RIGSWCAT.EXE which appears on the majority of the shareware disks (space permitting). In addition to giving full details of each item, the program also features a search and find facility.

HOW TO OBTAIN COPIES OF THE RIG SHAREWARE LIBRARY DISKS

There is a despatch fee of £2 per order, which covers up to 6 disks (i.e. **not** £2 per disk). Send up to a maximum of 6 formatted 1.44 Mb MS-DOS 3.5" disks per request, to Les Hamilton, 8 Deeside Place, Aberdeen AB1 7PW, Scotland. Disks must be sent in a sturdy, re-sealable package such as a padded Jiffy bag (or a package within a package). Each separate request must be accompanied by:-

i) a self-addressed adhesive label
ii) stamps for the return postage
iii) coins (or additional postage stamps) to the value of £2.

Note that overseas members' return postage is free, but an exchange of shareware or satellite images in lieu is always welcome.

Any RIG Member coming across any new or updated versions of useful shareware is encouraged to send them to me at the above address. Should you experience any problems running any of the shareware from the RIG Library, please enquire by letter, and I'll reply by return of post. ⊕

METEOSAT HIGH-RESOLUTION ENCRYPTION UPDATE

The UK Met. Office has always maintained that it is unreasonable to expect private PDUS users to pay a further license fee for the reception of satellite images, in addition to the 700ECU charged for the MKU (Meteosat Key Unit).

At a meeting in Darmstadt in November 1995 Mr Alan Douglas (UK Met. Office Marketing Director) argued the point successfully and it is now confirmed that the UK Met. Office will not seek any further fees from hobby/educational users.

The use of the data will be tightly licensed and be warned that the UK Met. Office will actively pursue any breach of the licensing agreement.

Mr. Alan Terry, the Met. Office Data Licensing Manager, said this is clearly a case where common sense has prevailed in helping a small number of dedicated enthusiasts to pursue an interest that would otherwise be denied them and will allow children and students to have a better understanding of our planet and the influences of the weather. ⊕

ORBITING UPDATE

ALL THE LATEST NEWS

POLAR ORBITING SATELLITES

NOAAs 9, 10 and 11 are all partially operating but only NOAA 10 is imaging. The visible images are good and the IR images have shown signs of improvement after the sensors were damaged last year. However, the APT transmitter remains off.

NOAA 12 is the operational morning-southbound craft with most systems operating normally.

NOAA 13 failed totally about two weeks after launch when an over-length screw penetrated insulation and caused a short-circuit.

NOAA 14 is operating normally as the afternoon-northbound craft. In October the command demodulator to the backup on-board processor failed. Failure of the primary system would terminate imaging.

NOAA K (NOAA 15 when in orbit) is scheduled for a late 1996 launch.

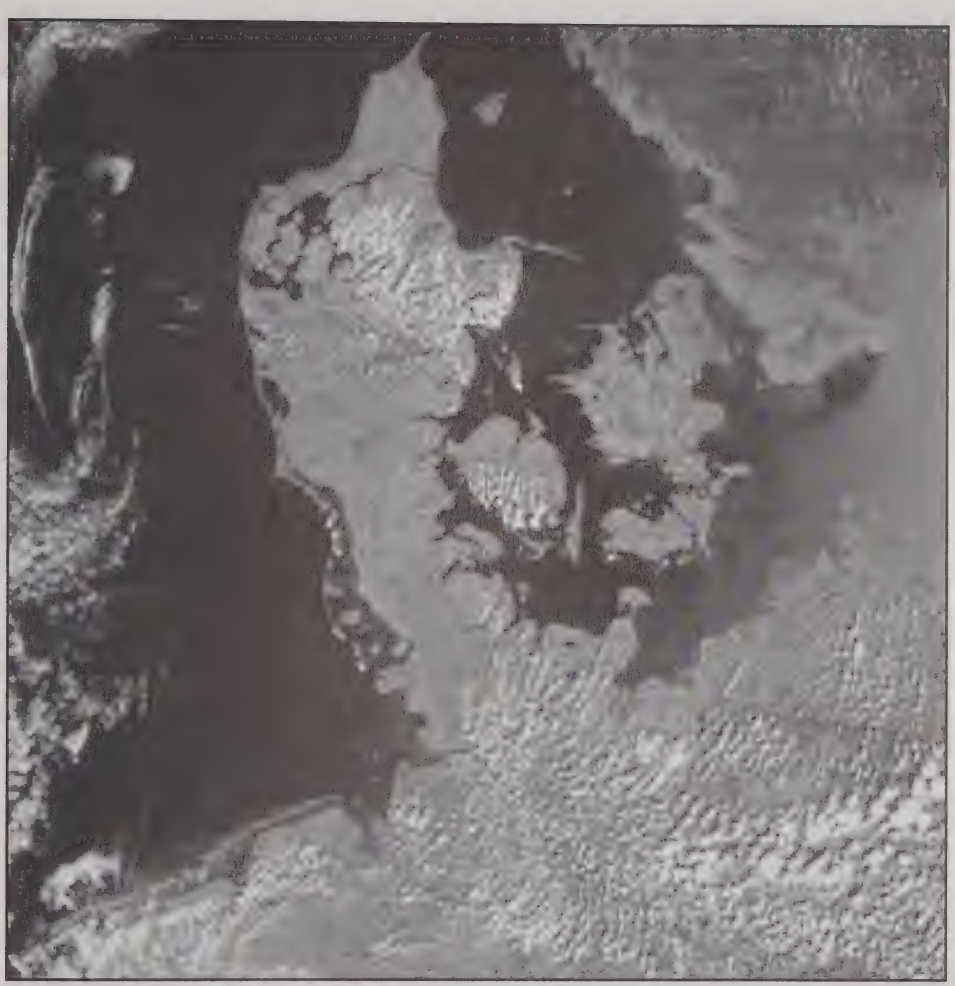
NOAA N, with a projected launch in 2000, will be the first to operate on the new APT frequencies of 137.10 and 137.9125MHz. These frequencies have primary allocation for meteorological satellites and the Mobile Satellite Service (MSS) has only secondary status whereas the existing frequencies of 137.50 and 137.62MHz have co-primary status with MSS.

METEOR 2-21 was switched back on on 1 February but will precess into the dawn within a short time.

METEOR 3-5 is currently off but is expected back on when the northbound afternoon passes become better illuminated at temperate northern latitudes in late February.

METEOR 3-6 has been silent for a long time but at the Coordination Group for Meteorological Satellites' meeting in May 1995 it was reported to be operational.

At the same meeting it was reported that consideration was being given to adding a meteorological package to a RESURS-O spacecraft rather than fly the last satellite in the Meteor 3 series. This would save on launch costs. The RESURS-O craft are designed for mapping, environmental monitoring of large areas, coastal zone monitor-



Denmark imaged by RESURS-O 1-3

ing, agricultural and forest fire measurements, snow cover assessment and ice monitoring. The swath width, at 600km, is too narrow and the resolution, at 170m, too high for general meteorological use.

The sample image, reproduced here, from RESURS-O 1-3, was received at the Kiruna ground station in Sweden where it was processed and made available by Eurimage through its Customer Services Facility in Frascati, Italy.

OKEAN 4 continues to operate in all imaging modes and together with SICH-1 these craft have transmitted many interesting images recently. In response to discussions

on the subject of "Okean and Sich hunting" on Internet, largely by RIG members, Alex Ivanov, in Moscow, is kindly making Okean and Sich transmission schedules available on a regular basis. Computers no longer have to stay on all night for fear of missing a stored image from some exotic part of the world. A quick analysis of these schedules shows that a significant proportion of the stored images are dumped to Kharbarovsk in the Russian far east, which means that our members in Korea and Japan may be able to receive some of them. Images of the Antarctic Peninsula, Okinawa, Timor and NW Australia, Colombia and Venezuela, as well as several of Alaska have been received in the UK recently. The one reproduced here was received from Sich-1 by James Brown in south Wales using an omnidirectional antenna and PROsat for Windows and shows a visible image of Alaska with the 9.52GHz radar image superimposed down the centre. Why the Ukrainian interest in Alaska? Geoff Perry suggests commercial reasons for this activity. Additional confirmation has come from Alex that the Sich and Okean craft are the same. He says "OKEAN and SICH are sister ships differing only with the flag on the hull (OKEAN - Russian, SICH - Ukrainian)".

FENG YUN-1C, the next Chinese polar-orbiting weather satellite is scheduled for launch in 1997 or 1998. Following concern expressed by other nations, the Chinese have agreed to change their CHRPT 10-channel imager transmission frequency to 1708MHz. Initially they planned to utilise the frequency of NOAA's HRPT transmitters (1707MHz).

GEOSTATIONARY SATELLITES

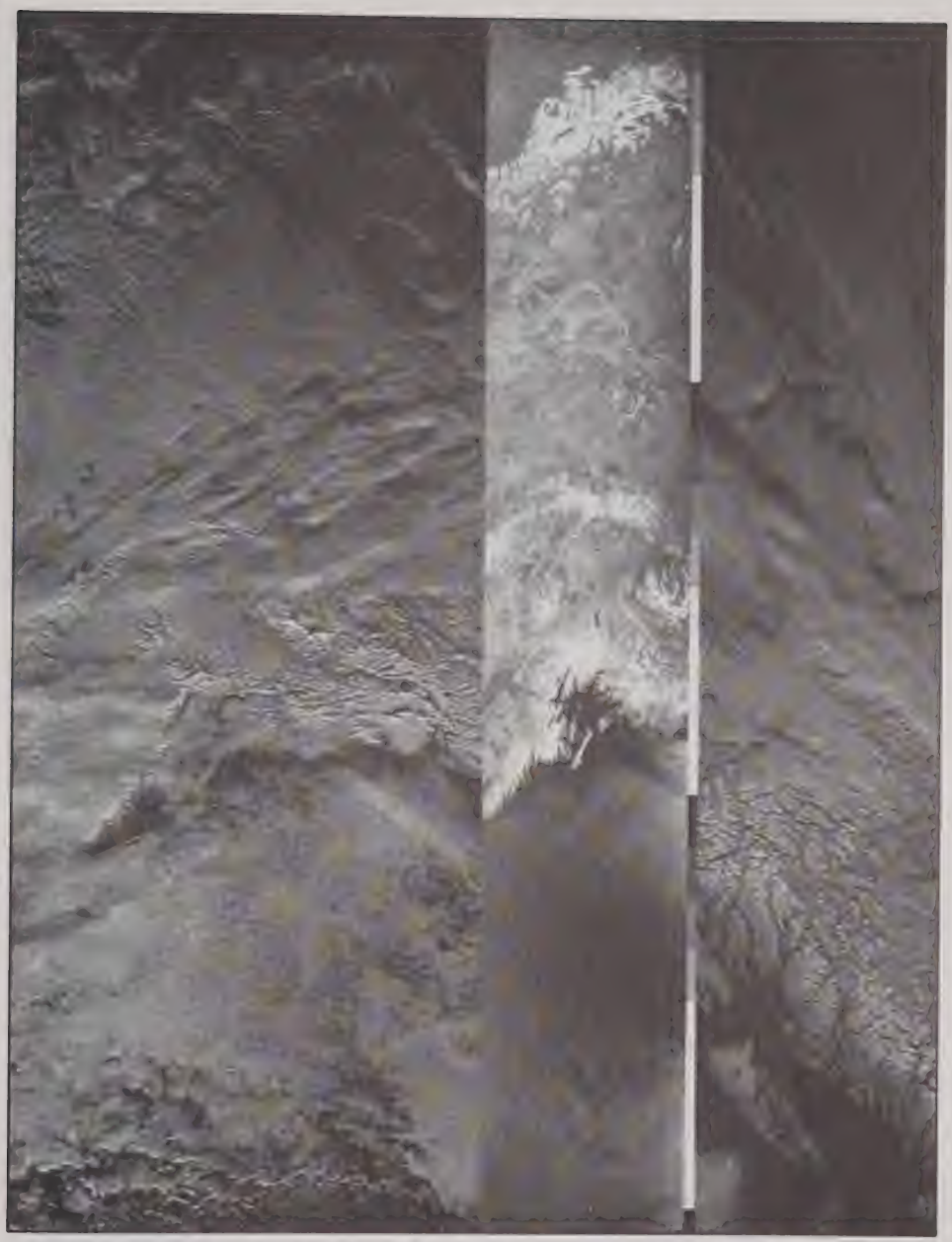
Meteosat operations were transferred from ESA/ESOC to EUMETSAT on 15 November and the MTP (Meteosat Transition Programme) officially began on 1 December.

METEOSATs 3 and 4 were boosted out of the geostationary orbit in November.

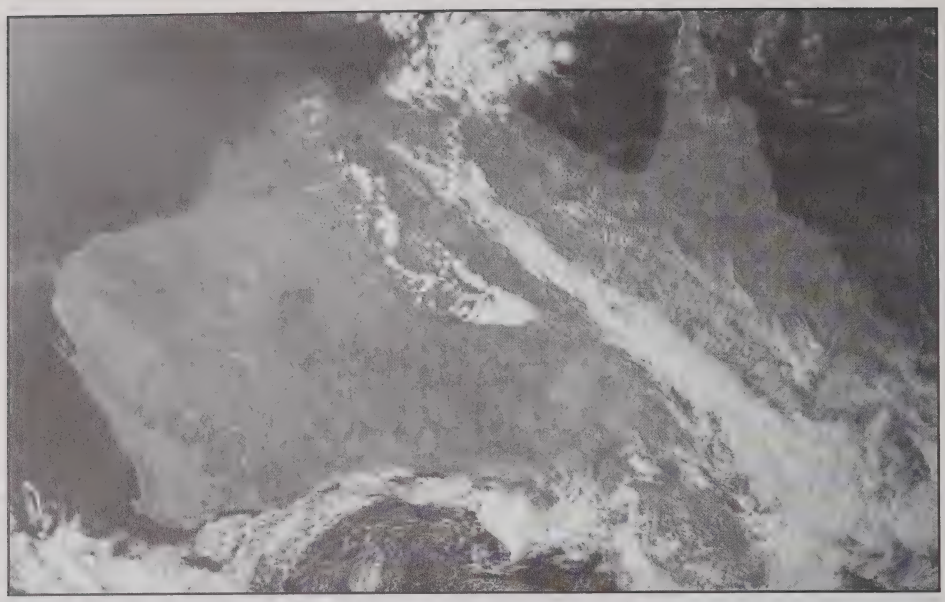
METEOSAT 5 continues as the prime mission satellite at 0 degrees longitude. Encryption of the high resolution data began on 4 December. The half-hour slots at 00, 06, 12 and 18UT remain unencrypted.

METEOSAT 6 is the backup spacecraft at the moment. The software and hardware tools to correct its image anomaly have been integrated into the EUMETSAT ground processing system. Some final tuning of that on-ground correction scheme is still required to make Meteosat 6 a fully qualified imaging Meteosat.

GOES 8 is operating at the GOES-East longitude of 75W and GOES 9 was moved to take over from GOES 7 as the GOES-West imager at 135W following its successful checkout phase at 90W. These two new generation craft should continue to image



SICH-1 Image of Alaska. Visible and radar, 30 January 1996 2310UT received in Wales 20 minutes later by James Brown



At 140 degrees E. GMS 5 is well placed to image Australia.

the Western Atlantic, the Americas and the Eastern Pacific for several years to come. Their successors are not due for launch until 1999 and 2000.

GMS 4, at 120E, is the backup for the currently operational GMS 5 at 140E. The successor to GMS 5 will be MTSAT-1, expected to be launched in 1999. MTSAT (Multi-functional Transport Satellite) is a communications satellite for Japan's aviation authority which will also serve as Japan's meteorological platform. It is a three-axis stabilised satellite based on the INTELSAT-VII bus and the imagers will be of the same type as those on the new GOES satellites.

GOMS 1, the Russian satellite at 76E, continues its check-out. Some test transmissions were made in January and regular three-hourly infrared WEFAX transmissions are expected soon. Serious problems with the visible imaging sensors are being experienced. One full disk image and four sectorised images, W1 to W4, covering the whole image area can be expected. Image format is virtually identical to that of Meteosat and the transmission frequency, like Meteosat's, is 1691MHz. It too is equatorially polarised. Unfortunately, its location puts it just below the horizon for members in the UK. GOMS 2 is due for launch in 1997.

Acknowledgements: I am grateful to Mike Phillips and Volker Gaertner at EUMETSAT, Geoff Perry MBE (Kettering Group), Alex Ivanov (RD SCAN, Moscow), NOAA and EURIMAGE for their contributions.

KEPLER ELEMENTS

```
NOAA10
1 16969U 86073A  96039.86144490  .00000061                        4966
2 16969  98.5165 040.6697 0013943 014.6630 345.4937 14.24973313488180
NOAA12
1 21263U 91032A  96039.79600603  .00000073                        8125
2 21263  98.5682 062.5526 0012230 294.2538 065.7363 14.22595983246067
NOAA14
1 23455U 94089A  96039.85402305  .00000028                        4891
2 23455  98.9308 345.8226 0008571 248.5857 111.4400 14.11567017057206
METEOR 2-21
1 22782U 93055A  96036.16081923  .00000052                        4603
2 22782  82.5483 092.5776 0023147 355.0506 005.0409 13.83047529122746
METEOR 3-5
1 21655U 91056A  96038.06770072  .00000051                        8657
2 21655  82.5511 053.0742 0013871 132.5853 227.6450 13.16844888215411
METEOR 3-6
1 22969U 94003A  96037.00630003  .00000051                        2309
2 22969  82.5593 353.7541 0014232 205.0747 154.9671 13.16734774097650
OKEAN 4
1 23317U 94066A  96037.54439978  .00000153                        1295
2 23317  82.5437 180.1214 0026233 144.8870 215.4075 14.73995804071149
SICH 1
1 23657U 95046A  96037.18455838  .00000158                        0548
2 23657  82.5364 322.0576 0028664 115.0299 245.3894 14.73450690023392
```

Frequencies: NOAA 14 137.62MHz, NOAAs 10/12 137.50MHz
METEORs 137.30, 137.40 or 137.85MHz
OKEAN 4, SICH 1 137.40MHz

Explanation of elements format above:

Line 1: NORAD catalogue number, International designation, Epoch, Decay rate (NDOT/2), Bulletin number (thousands omitted), Checksum (1 digit).

Line 2: NORAD catalogue number, Inclination, Right Ascension, Eccentricity (decimal point omitted), Argument of perigee, Mean Anomaly, Mean motion (8 decimal places), Rev. number, Checksum (1 digit).

RIG GIF LIBRARY

PETER WAKELIN

I am making up one more disk (number 147) of Okean and Sich images. I have not finalised the content because better and better images keep appearing, like the excellent one from James Brown, which appears on page 73. These spacecraft also transmit high resolution imagery on 465MHz and RIG will give a year's subscription to the first person to send me an image from this source.

The library now contains over 60MB of images, mostly from RIG members, and for the benefit of 1996's new members, the full index is reproduced below. I understand that because of some licensing agreement difficulties, some image viewers no longer support the GIF format. We may have to consider changing the format of our library images but with around 600 disks requested each year the service will continue.

GIF LIBRARY INDEX

100	VPIC viewing programme with PKUNZIP +8 images selected from other disks. Starter pack with simple to follow instructions.	
101	APT. Mostly NOAA. Some colour. (9 images)	Mainly M Goodall
102	Americas. Mostly HRPT. (14)	
103	Americas. HRPT. (10)	
104	Space Shuttle, Planets. (9)	
105	Miscellaneous. (10)	
106	North America. HRPT, Meteor. (7)	
107	Europe. HRPT. (11)	Marciano Righini
108	Europe, Greenland. HRPT. (9)	Peter Hayes
109	Europe. HRPT. (11)	P Hayes/M Righini
110	Mainly PDUS. (6)	J Brown/M Righini
111	Feng Yun. (5)	
112	Okean. (14)	Mainly L Hamilton
113	North America. HRPT. (7)	Tom Loebl
114	Australia, Pacific. (7)	Mainly M Delahunty
115	Mainly N & E Europe. Meteor. (17)	Ulf Jander
116	Europe, Greenland. Meteor. (9)	R Whitby/G Shipton
117	Greenland. Meteor. (4)	
118	Shuttle, Mars. (4)	
119	Various, including Arabia APT. (5)	
120	Jupiter, Saturn and their moons. (10)	
121	Europe. Multispectral. (10)	D Cawley/C Roberts

122	Iceland, Greenland. HRPT. (5)	P Wakelin
123	Europe. HRPT. (3)	P Wakelin
124	Europe. HRPT. (4)	P Wakelin
125	Europe. HRPT. (4)	P Wakelin
126	Europe. Multispectral. (7)	Trevor Smithers
127	Slow-scan IR. Meteor 3-5. (15)	Les Hamilton
128	British Isles. HRPT. (5)	P Wakelin
129	Africa. PDUS. Meteosat. (5)	P Wakelin
130	NOAA 13 images. (5)	
131	Africa/Mid East. NOAA, Meteor. (5)	
132	High res GMS-4 at 140 deg E. (1)	
133	Comet/Jupiter collision. (13)	STScI
134	Rabaul Caldera eruption. (18)	
135	JVFAX images. Meteosat. (6)	Mike Goodall
136	Okean 4. Radar/microwave/vis. (6)	D Bonomo/P Wakelin
137	SE Asia, Japan. HRPT. (6)	N Kajikawa/C van Lint
138	SE Asia. HRPT. (5)	Chris van Lint
139	NOAA HRPT Europe, Mid East, N Africa. (6)	Ferrucio Paglia
140	Hubble Space Telescope Images. (6)	STScI
141	British Isles cloud dispersal. (5)	Peter Wakelin
142	Hurricane Marilyn. One high res image.	GOES 8
143	Okean and Sich images. (5)	
144	Meteosat 5 PDUS images. (4)	Ferrucio Paglia
145	Meteosat 5 and 6 PDUS images of Africa. (6)	Peter Wakelin
146	1995 Atlantic Hurricanes. (4)	
147	More Okean and Sich images	

HERE'S HOW TO OBTAIN DISKS

The cost is £2 for the first disk plus one pound for each additional disk with no limit to the number ordered. RIG provides disks, packaging and postage. For small orders, UK members may prefer to send postage stamps rather than write cheques for small amounts.

UK members: Cheque or postal order made payable to Remote Imaging Group and sent to Peter Wakelin, 1 Charters Road, ASCOT, Berkshire, SL5 9QF. There is no credit card service for members in the UK.

Other members: Bank draft (in Sterling and drawn on a London-based bank) or Eurocheque made payable to Remote Imaging Group and sent to Peter Wakelin at the address above. Overseas members may prefer to pay by credit card (subject to a 3% surcharge). Credit card orders should also be sent to Peter Wakelin either by post or fax (+44 1344 26028). ⊕

RIG HELPLINES

General enquiries Meteosat information, NOAA information, Complaints about RIG-supplied equipment.	John Tellick	0181 390 3315

A copy of the Group's rules can also be obtained from John Tellick

Russian and Chinese satellite information	Peter Wakelin	01344 23200
HRPT	Peter Wakelin	01344 23200
PDUS	James Brown	01656 782632 *(not available on Sundays)*
Antennas and computing	John Boyer	01293 776862 *(7.00pm-9.00pm not Tuesdays or Wednesdays)*
Schools/educational co-ordinator	John Tellick	0181 390 3315

Schools/educational enquiries	John Murray	Torquay	01803 386252
	Frank Bell	Godalming	01483 416897
	Tom Walter	Reading	01734 871330
	Bob Coombes	Haslemere	01428 642930
	John Din	Bristol	01454 773387
	Alan Wright	Norwich	01603 713449
	Rob Bales	Merseyside	0151 3439300

Microcomputer specialists:

PC and printer problems	Mark Pepper	01344 777730 *(8.00pm-9.00pm)*
Commodore Amiga	Chris Pretty	01420 82752
Archimedes	Tom Walter	01734 871330

NOTE: We are grateful to the above members for offering their services to the Helpline. Please do not abuse the service by ringing them for queries other than those listed against their names.

Most of the helpline numbers listed under Schools/educational enquiries are situated in the south of England. John Tellick (address on page 2) would be pleased to hear from members in the educational field in other areas who would be willing to give help and advice.

REMOTE IMAGING GROUP

RIG SUBSCRIPTION - NEW MEMBER

If you would like to become a member and receive the Journal, photocopy this page, complete the form below, sign the declaration and send it to...

RIG SUB, PO BOX 142, Rickmansworth, Herts, WD3 4RQ, ENGLAND

The subscription rates for 1996 are...

UK membership	£10.00	Europe outside EC	£12.00
Europe EC	£12.00	Outside Europe	£14.00

Name _____ Call Sign (if any)_____

Address. _____

_____

_____Post Code_____

Country _____ Telephone No._____

Are you receiving:
Polar-orbiting Weather Satellites _____ Geostationary Weather Satellites _____

Do you require back issues? (see Rig Shop Corner) _____

Amount Enclosed £_____

Payment by Visa/MasterCard/Eurocard - there is no surcharge:

Card No._____ Expiry date_____

Signed _____ Date _____

Are you willing to have your name/address made known to members in your area?
YES / NO. *(Delete as applicable)*

DECLARATION: I do NOT object to the Remote Imaging Group holding my Membership details on a computer.

Signed _____ Date _____

RIG SHOP CORNER

ALL PRODUCTS ARE FOR SALE TO RIG MEMBERS ONLY, FOR THEIR OWN PERSONAL USE AND NOT FOR SELLING-ON.
IN THE EVENT OF PROBLEMS WITH EQUIPMENT PURCHASED FROM RIG PLEASE CONTACT RIG IN THE FIRST INSTANCE AND NOT THE MANUFACTURER.

All prices shown include post and packing except where marked

Receiving / Decoding Equipment	UK/EC Price	Overseas Price
RIG*sat*-RX1 two-channel 137MHz self-build receiver.		
PCB, crystal IF filter and FETs	£12.00	£13.00
PCB and FETs only	£8.00	£8.00
RIG*sat*-RX1A 5-channel upgrade PCB	£4.00	£4.00
RIG*sat*-IF1 PCB only	£4.50	£5.00
RIG DARTCOM Meteosat Downconverter. Assembled and tested module in tin plate box	£155.00	£132.00
Complete, assembled and mounted in weather-proof box.	£190.00	£162.00
RIG DARTCOM VHF Scanning Receiver. Assembled and tested module with LED channel number display.	£135.00	£115.00
As above but with LCD frequency read-out instead of LED channel number display. *Both the above items are modules and require a box, together with several components, switches, etc.*	£179.00	£152.00
RIG VHF Preamp. Includes a bandpass filter and is ideal for mast-head mounting. Assembled/tested module; needs boxing.	£18.00	£16.00
RIG 1695MHz Low Noise Amplifier kit. *Experienced constructors only.*	£29.00	£25.00
Martelec JVFAX Interface Unit	£78.00	£70.00

Connecting lead £5 extra (specify whether 25 or 9-pin required)

Antenna Systems	**UK Price**
RIG CROSSED DIPOLES A Turnstile type design, in kit form	£26.00
RIG/TH2 47-element YCV loop Yagi (1.7GHz)	£85.00
JAYBEAM 5X-Y 2m 5 element crossed Yagi, in kit form	£55.00

DISHES, FEEDS and BACKING PLATES not available by mail order. Contact Henry Neale. Tel:01945 440353

Crossed dipoles and the YCV loop Yagi can be dispatched overseas. Postage extra. Details on request from Peter Wakelin.

RIG Journal Binders

UK Price £4.00 each, EC/European Price £4.50, Outside Europe Price £5.00.

CD-ROMS	UK Price	EC Price	Other Price
Meteosat No. 2, Weather in Motion	£12.50	£13.50	£15.00
Meteosat No. 3, Europe's Four Seasons (2 disks)	£12.50	£13.50	£15.00

Back Issues of RIG Journals

		UK Price	**EC/Europe Price**	**Outside Europe Price**
RIG 8-11	1987	£5.00	£6.00	£7.00
RIG 12-15	1988	£5.00	£6.00	£7.00
RIG 16-19	1989	£5.00	£6.00	£7.00
RIG 20-23	1990	£6.00	£7.00	£8.00
RIG 24-27	1991	£6.00	£7.00	£8.00
RIG 28-31	1992	£6.00	£7.00	£8.00
RIG 32-35	1993	£6.00	£7.00	£8.00
RIG 36-39	1994	£6.00	£7.00	£8.00
RIG 40-43	1995	£6.00	£7.00	£8.00

Note: Prices quoted are for a set of four, including Post and Packing.

RIG 1-7 are currently out of print. Owing to depletion of some issues, photocopies may be supplied. Individual issues are no longer available (hardship cases excepted).

Ordering Information

All items are available from the Editor, Peter Wakelin (address on page 2) and include return by UK 1st class mail (except antennas and Journals). Items to non-UK addresses sent via airmail.

UK VAT is now applicable on sales to the following EC countries - France, Germany, Belgium, Portugal, Spain, Republic of Ireland, Austria, Sweden, Denmark, Italy, Luxembourg, Netherlands, United Kingdom (including Isle of Man). Members in these countries should use UK/EC price when ordering. EC members who are registered for VAT must forward their VAT registration No. to the Treasurer to enable them to receive VAT exempt goods.

As UK/EC prices now include VAT where applicable; receipts will be issued upon request. Remote Imaging Group VAT Registration No. 594 7483 83. Channel Isles: divide by 1.175 to remove VAT content.

UK members, By Cheque or Postal Order.

Overseas members, Pay by Bank Draft (drawn on a UK London-based bank) or Eurocheque(s). (Payments to a Maximum of £100.00 in any one Eurocheque). No local currency please.

All cheques made payable to "REMOTE IMAGING GROUP".

Credit Cards Accepted (Access/Visa/Mastercard/Eurocard) Add 3% to Total. Available by MAIL ORDER from Peter Wakelin (address on page 2) or FAX 01344 26028 (International +44 1344 26028).

Please state type of card, Card No., Expiry Date.
All Credit Cards authorised before goods are despatched.
(Note: Ordering by Credit Card does not mean instant despatch!)

When contacting Advertisers please mention that you are a member of RIG.

BULLETIN BOARDS

Orbital elements and other information of use to members are available from several electronic bulletin boards. Those listed below all offer free service and are available 24 hours a day.

Telephone numbers:	RIG BBS	01945 440666 8bit, no parity, 1 stop bit
	Dartcom BBS	01822 88249 8bit, no parity, 1 stop bit

SUBMISSION OF ITEMS FOR PUBLICATION AND COPY DEADLINES

Please send contributions, which should be original, to the Editor. Although typed and hand-written items are quite acceptable we would prefer longer pieces to be on a PC disk in one of the popular word-processing formats, ideally in Word Perfect. Drawings and diagrams may be submitted on disk, preferably in a Windows Meta File compatible format, but please send hard copy also. Diagrams and images must be in separate files and should not be embedded in documents. To reproduce well, satellite images must have a good range of tones. Contact the Editor for further information.

COPY DEADLINE FOR THE JUNE ISSUE: 25 April 1996

Advertisers' copy is required by 25 April 1996 and should be sent direct to Michael Gill (address on page 2).

DESCRIPTION OF COVER IMAGES

Front Cover:

Starting with an outline drawing from a NOAA publication, Michael Gill exercised his artistic talents to create this realistic picture of the satellite many of us listen to.

Inside Front Cover:

Two single-channel images have been coloured with different objectives. The top image is from Enrico Falconelli's own NOAA95 HRPT system and depicts a cloudless channel 2 scene in western Algeria. A good range of colours has been used to significantly enhance ground detail. The lower image, from Frank Bell, was received when

much of Britain was experiencing an easterly gale with sub-zero temperatures. Using JVFAX, this thermal infrared image has been coloured using 'masks' - blue for sea and brown for land areas. This may have enhanced its value as a picture but the land/sea/cloud temperature relationship has been lost.

Inside Back Cover:

These two diagrams relate to Chris van Lint's article on the Quadrafilar antenna in this issue and were reproduced in colour to facilitate the construction of the helix.

Back Cover:

These three images are selected portions of the sky as seen in the Hubble Deep Field (HDF) observation - the "deepest-ever" view of the universe made with the Hubble Space Telescope. 342 consecutive exposures, typically of 15 to 40 minutes duration, were made by the Wide Field Planetary Camera 2 (WFPC2) in December 1995.

Representing a narrow "keyhole" view stretching all the way to the visible horizon of the universe, the HDF image covers a speck of sky just one thirtieth the apparent diameter of the moon. This is so narrow that only a few foreground stars in our Milky Way Galaxy appeared in the field and they are vastly outnumbered by the menagerie of far more distant galaxies.

The most distant galaxies in the images are so far away that the universe was less than 10 percent of its present age when they were formed. The light started its journey to Earth several billion years before our solar system came into existence. Image courtesy Robert Williams and the Hubble Deep Field Team (STScI) and NASA. Thanks also to Cambridge University for easing congestion on the STScI server by making Hubble Space Telescope images available on theirs (http://www.ast.cam.ac.uk/HST).

LATE NEWS:

Opposite:

The image from Meteor 3-5 on page 85 extends from near Bermuda, bottom left, to the north pole, top left. The lower portion of the image was received by Arthur Holmes in Toronto at 1240 on 30 September 1995. Les Hamilton received the northern part in Scotland and stitched the two together. ⊕

Annapolis, Maryland USA
10 - 12 June 1996

Fourth International Satellite Direct Broadcast Services Symposium for NOAA Polar-orbiting Observational Environmental Satellites (POES)

A program of international speakers is scheduled to inform users of current and future plans of U.S. and international polar satellite systems. The core themes will discuss changes occurring with NOAA's new series of polar-orbiting satellites -- NOAA K, L and M, and the changes to direct broadcast systems in the NOAA KLM era. Examples of specific direct readout applications will be presented.

Program, registration and exhibitors information should be requested from the symposium coordinator:

Informatics, Inc.
Attn: Judy Rumerman
7501 Greenway Center Drive, Suite 700
Greenbelt, MD 20770 USA

Telephone: 1 301-345-2000 extension 135
FAX: 1 301-441-1771
EMAIL: POESUSER@infrmtcs.com

A quarterly publication for hardware, software and applications of WEFAX, APT, VAS, HRPT and GOESTAP.

WeatherSat Ink

The Environmental Satellite Applications Journal

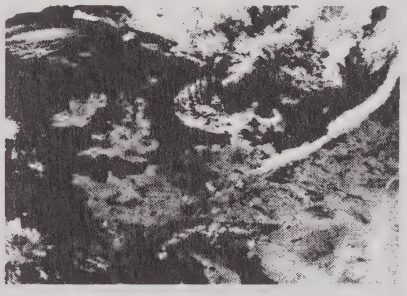
4821 Jessie Drive, Apex, NC 27502, USA

$15 US per year $20 all others, US funds

MasterCard / Visa OK with $1 surcharge

TH2 Imaging

34 Princes Gardens
Margate
Kent CT9 3AR
Tel : 0843 - 223831
Fax : 0843 - 862212



TH2SAT PC Weather Satellite Processing System Version 2.2

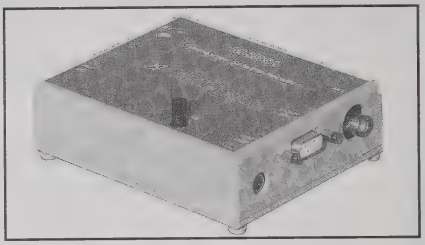
- Instantaneous control of input levels from keyboard while receiving
- Input levels automatically saved
- Large range of *simple to operate* image processing commands
- Very simple image pseudo-colouring facilities (including infra red)
- High definition images obtained due to high 4800 hertz sampling rate
- Colour animation included as standard
- Fully working demonstration program available for £3.50

Price £100 + postage (RIG members)

Receivers Antennas Preamplifiers

MSR50 Virtual Satellite Receiver

A new and really exciting way to receive weather satellites. The MSR50 is a very high performance, synthesised receiver, totally controlled from your PC (IBM compatible or Amiga), providing unrivalled performance and features at a very modest price. For details see the feature in RIG43. The MSR50 is supplied complete with software (either PC or Amiga), and cable.



***Special Introductory Price* £150.00 incl.**

MSH20 Professional 137MHz Crossed Dipole

A very rugged, well made turnstile. Comes with stainless-steel fastenings, and 20m terminated coaxial feed cable. **£59.50 incl.**

MSA20 137MHz Crossed Dipole

Standard turnstile antenna. Complete with 20m terminated coaxial feed. **£49.50 incl.**

MSK30 VHF Preamplifier

A low noise 137MHz preamplifier in sealed diecast box. This new design offers low noise (typ. 1dB) & gain = 10dB **£23.50 incl.**
Also available without case as MSK30M **£18.80 incl.**

MSY50 Loop Yagi

A High-quality 1.7GHz loop Yagi antenna for Meteosat/GOES/GMS reception. Ideal for use with MSC30/MSC50 downconverters. Gain typ. 22dB. length approx. 3m. **£112.00 incl.**

MSF30 1.7GHz Dipole Feed

A Meteosat/GOES/GMS dipole feed assembly featuring N-type output socket, and adjustable for focus and polarization. Suitable for dishes with f/d in the range 0.35 - 0.42. **£56.00 incl.**

---------- ***ALL PRICES NOW INCLUDE U.K. CARRIAGE & VAT*** ----------

For additional products, including cables, crystals, connectors and accessories, please send a large (A5 or bigger) 25p S.A.E.

Ordering Information

Prices shown now include VAT for UK and EU countries. For all non-UK countries additional carriage will be charged at cost. Payment may be made by cheque, postal order, or Visa/Access/Mastercharge cards.

martelec *communication systems*

The Acorns, Wyck Lane, East Worldham, Alton, GU34 3AW, England. Tel/Fax 01420 82752

Downconverters Systems Components

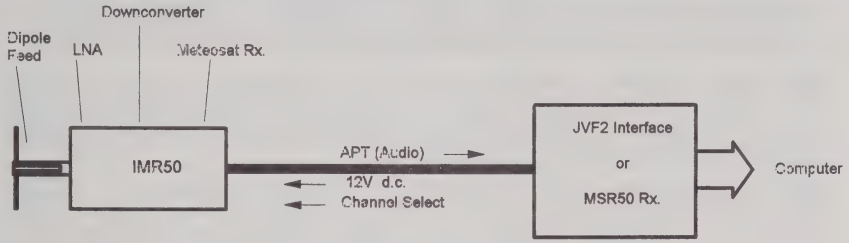
NEW! IMR50 Integrated Meteosat Receiver

This is an entirely new concept in Meteosat reception - a unit that combines the dipole feed, low noise amplifier, downconverter, and receiver, all in one unit! Now one integrated unit at the focal point of the dish delivers WEFAX demodulated audio data direct to your computer interface, doing away with expensive coaxial cables and connectors, and reducing signal losses to a minimum.

Features

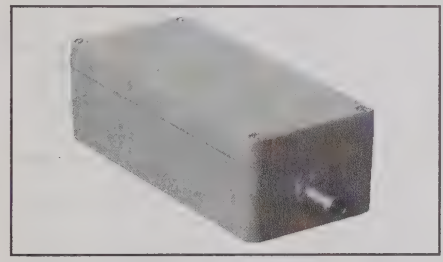
- **Direct-coupled dipole feed results in better signal-to-noise ratio**
- **No coaxial cables and connectors to be weather-proofed**
- **Simpler installation, uses ordinary 4-core cable**
- **Can be connected directly to JVFAX interface**

Special introductory price £299.00 incl.



NEW! MSC30 & MSC50 Downconverters

We proudly announce the MSC50, a new downconverter for '96. Outwardly the same as the MSC30, and sporting the same high performance, but having only one crystal oscillator to reduce the cost. This is of special interest to GOES and GMS users since, unlike Meteosat, these satellites have only the 1691MHz channel. MSR50 owners can also benefit since Meteosat's second channel on 1694.5MHz can be found by tuning the MSR50 to 141MHz!



Both downconverters now incorporate NEC's latest PHEMT for the best possible noise figure. As before, the output is boosted to facilitate very long feed cable runs without affecting performance. The MSC30 and MSC50 are housed in professional sealed diecast boxes, and can be powered either via the coaxial feed cable, or by separate 12V d.c. cabling. High quality N-type input, and BNC output. Both types come complete with 1.25m N-type/N-type cable, all connectors, and even silicon self-amalgamating tape for weather-proofing the connections!

MSC30 Two-channel Downconverter £205.00 incl.
MSC50 Single-channel Downconverter £180.00 incl.

martelec *communication systems*

The Acorns, Wyck Lane, East Worldham, Alton, GU34 3AW, England. Tel/Fax 01420 82752

Timestep Offer to RIG Members
PROsat II Capture Card

PROsat II has become the most widely respected and definitive Weather Satellite Capture program used by RIG members. It will operate in most contemporary PC's (286, 386, 486 etc with SVGA) and uses one internal slot. All software features are selected with user-friendly mouse-operated pull-down menus. False colour can be added to good quality visible light images. Capable of receiving and decoding all known analogue weather satellites, PROsat II sets new standards in Software and Hardware design. Image processing, full colour animation and 3D are just some of the many features currently included. New features are constantly being added. Now technical support is directly from Timestep. Timestep Weather satellite systems are used and recommended by Arthur C. Clarke, author of "2001 : A Space Odyssey" and inventor of the communications satellite.

Other software comes and goes, sometime the flavour of the month, sometimes forgotten.
PROsat II just gets better and better ! When the new Okean 4 was switched on, it came as no surprise that PROsat II users merely clicked on OKEAN and achieved perfect results, first time.

Geostationary Satellites Meteosat, GOES and GMS are all geostationary satellites; they orbit at the same rate as the Earth and hence appear to be fixed in the sky. Images are therefore constantly available. The PROsat II system covers all known analogue geostationary satellites; images of the Earth's surface can be received as often as every 4 minutes. A small dish antenna is required together with some simple reliable hardware.

Polar Orbiting Satellites NOAA, Meteor, Okean and Feng Yun are polar orbiting satellites. They pass near to the poles about every 110 minutes. Each satellite passes over most countries twice a day at a different time each day. Their strength is such that a simple fixed antenna can be used. Direct readout of temperature along with latitude and longitude is an important feature of the software. Now land/sea and political boundaries can be superimposed on to the image and "nudged" if they are not quite perfectly aligned. All of the satellite data is stored; a full view of Infrared and Visible images are shown on the screen during reception.

Colour Animation Full screen, full colour animation is now standard. Up to 1,000 images can be automatically animated. The colour is realistic and computer processed (D2 section only) and even shows relative temperature by the shades of blue for the sea and green for the land. Clouds show up as white and shades of grey. Reception is completely automatic. Run the software and walk away; every time you pass, the computer will be showing the very latest sequence.

Geostationary Features
Images as often as every 4 minutes
Live display of incoming images in 64 grey scales
Auto schedule to save images
Pan and zoom to greater than pixel level
3D display
Median filter to remove country outlines
False colour with AutoSet
1,000 frame colour animation (option)
Transect between any two points
600 DPI, 300 DPI and dot matrix printing
Windows export
Annotation

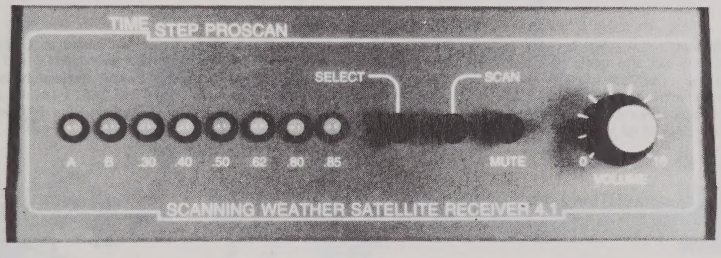
Polar Features
Reception of all polar satellites
Live display of incoming image in 64 grey scales
Auto schedule to save images
Saves the complete pass in full resolution
Temperature readout with no calibration
Latitude and Longitude gridding
Country and State outlining
Distance and Bearing between any two points
Your location shown on image
600 DPI, 300 DPI and dot matrix printing
Windows export
Annotation

Track II The tracking program used by most serious satellite watchers. This is not public domain and was written by Peter Arnold our Cambridge Graduate. Up to 6 satellites can be shown on screen all at the same time. Actual locations, their footprints and their rise and fall times are always shown. To our knowledge, no other program provides these features.

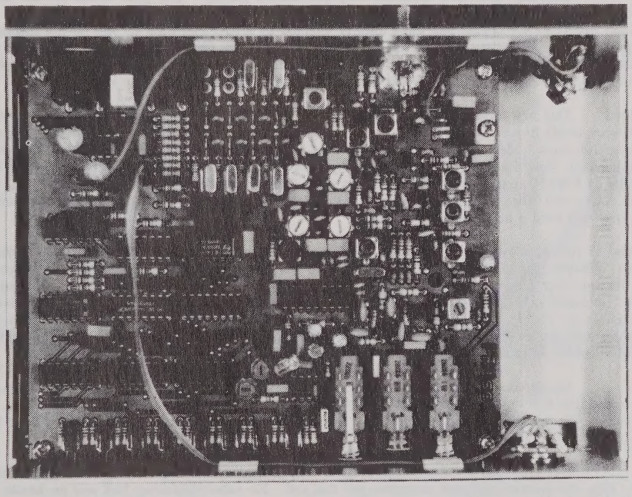
PROsat II card/software including Colour Animate & Track II £99.00
PROsat/PROscan connecting cable £15.00 **All prices include VAT** just add £6.00 carriage

Timestep PO Box 2001 Newmarket CB8 8XB England
Tel. 01440 820040 Fax. 01440 820281

Timestep Offer to RIG Members
PROscan Polar Receiver



What do you want from a Scanning Weather Satellite Receiver ? a) Intelligent squelch that only responds to weather satellites and is quiet when no satellite is present b) To be able to read the frequency directly from the front panel when it stops on a satellite c) To be able to "lock out" unwanted satellites d) Resistant to pager interference up to the pager transmitter itself (where of course the field strength is low e) Resistant to pager interference at 1 to 2 miles where the field strength is at a maximum f) An unconditional 12 month money back guarantee g) Full technical support directly from Timestep **and** h) the ability to control the receiver frequency from the computer so that you are sure that **all** passes can be received in your absence.



The PROscan receiver uses a lot of filtering, 3 coils in the pre-amp (optional), 4 coils in the RF amp (total 7 coils at RF), 3 coils in the oscillator, 1 matching coil at first IF, 5 ceramic filters at first IF, 5 coils at second IF (total 11 IF filters) and a quadrature discriminator for linearity and high ultimate signal to noise. A preamplifier is not required for short cable runs but adds extra selectivity and makes up for feeder loss on longer runs.
PROscan receiver £225.00 VHF Preamp in diecast box £25.00 Computer channel controller £65.00
All prices include VAT, just add £6.00 carriage

Timestep PO Box 2001 Newmarket CB8 8XB England
Tel. 01440 820040 Fax. 01440 820281

Trade Talk

** Spring news to **RIG Members** from Timestep **

APT Equipment We have all parts available for NOAA, Meteor, Okean, Sich, Feng Yun, Meteosat, GOES, GMS and Elektro, we can also quote for Insat. We have antennas, preamplifiers, cable, receivers and both internal and external serial interfaces. Our Meteosat preamplifier for example, when measured on a very expensive Hewlett Packard Noise Figure Test Set often gives a noise figure of just 0.35dB and once bought can be used with HRPT and PDUS later if required. PROsat II is now down even further in price (we pay your VAT !) The Computer controller that allows your PROsat II card to change the channel on your PROscan receiver when in schedule mode, is now less than half price !

Call for your full colour catalogue.

PDUS The good news is that once you have bought the Key (from the Met Office/Eumetsat) and the Key Interface from us at just £150.00, you will get free access to whole earth images every 30 minutes and 2.5KM European images also every 30 minutes. Expensive; but like having NOAA every 30 minutes only twice as good !

HRPT Following intensive development we now have a helical feed that works as well, if not better, than the dual feed and combiners AND it's £100.00 less to use ! It's lighter and doesn't need such elaborate metalwork to hold the dish to the rotator, hence the dish price is down too ! And it's available without the ground stand that you can get cheaper from your local TV satellite supplier. The new **analogue** card is now out and gives images as low as 0.5 degree. The tracking controller comes with a modified version of Track II and works perfectly with all but directly overhead passes, giving you time to have a cup of coffee, read the paper, AND get the best images you can have.. at any price. Read the rave reviews and articles in RIG 42. 1.1Km resolution, 5 spectral bands, 10 bit data, 80Mb data files, false colour, multi-spectral colour from any 3 bands (requires Multi-spectral view II) and the greatest fun and resolution you are ever going to get (well for 10 years at least).

RIG Prices Timestep offer RIG members very preferential pricing. The price exists for the duration of the magazine, therefore pricing quoted in Issue Number 43 has now expired and the pricing in this issue will expire when RIG 45 is printed. If you are asking us for prices, you must identify yourself as a RIG member. If you do not mention RIG every time you will be quoted the standard list price. All prices to RIG members are cash with order (no credit), we cannot supply items to anyone other than yourself. Quotations if requested will be sent to your home address and reflect current RIG prices. All price now include VAT. Remember PROsat II has now gone down in price (we pay your VAT !)

PROsat for Windows This new system reviewed in RIG 43 is available from stock right now. With 24 bit video cards you can run in 256 grey levels in real time, as well as having automatic colour on Meteosat, the choice is yours. In less than 1 month we sold over 100 units ! Meteosat temperature calibration and colour temperature colour slice on Meteosat Animation is now built in as standard. New features are constantly being added and we expect it to become the new World Standard. The introductory price is £249.00 (retail is £351.00). At this price there is unfortunately not an upgrade path. Your existing PROsat II for DOS cables will work just fine, but if you wish to take advantage of the automatic PROscan receiver channel switching function, you will need a new cable at £29.50.

Multi Spectral View II for Windows The limitations of DOS video card drivers and resolution have now been lifted with this completely new Windows version. Multiple image windows can be viewed simultaneously and extra features such as cubic interpolation for smoother zoom, printing on any Windows compatible printer and vegetation index are just a few of the reasons to upgrade. Intended mainly for HRPT and LANDSAT interpretation this new version will produce composites of NOAA APT by combining Visible and Infrared images, an example of this can be found in the PROsat for Windows brochure. Images from any of our software can be viewed in 256 grey levels and true 16.7 million 24 bit colour. The new price is £233.83 and upgrades to existing users are £125.00. A colour brochure will be available early 1996.

Pager Interference Interference is still getting worse, the RF level appears to be the same but it's spreading all over the country now. Remember that our receiver is one of the best available and is on a 4 week money back trial. If it doesn't cure your interference or you just don't like it, we will take it back and refund your money. After selling over 2,000 of these receivers we have only had 2 refunds !

BBS Our BBS can be accessed by anyone with a modem. You do not need to be on Internet or have any complications. Plug the modem into your computer and that's it. No subscriptions no fees and no hassle. It is mostly updated every week and never more that 14 days old. Elements and news files and satellite status reports are easily down-loaded so that you can update your software and print the out news to read at your leisure. We can handle virtually any standard right up to 28,800 The number to call is 01440 820002.

All prices include VAT, just add carriage at £6.00. Visa and MasterCard credit cards taken on orders over £25.00.

Timestep PO Box 2001 Newmarket CB8 8XB
Tel. 01440 820040 Fax. 01440 820281

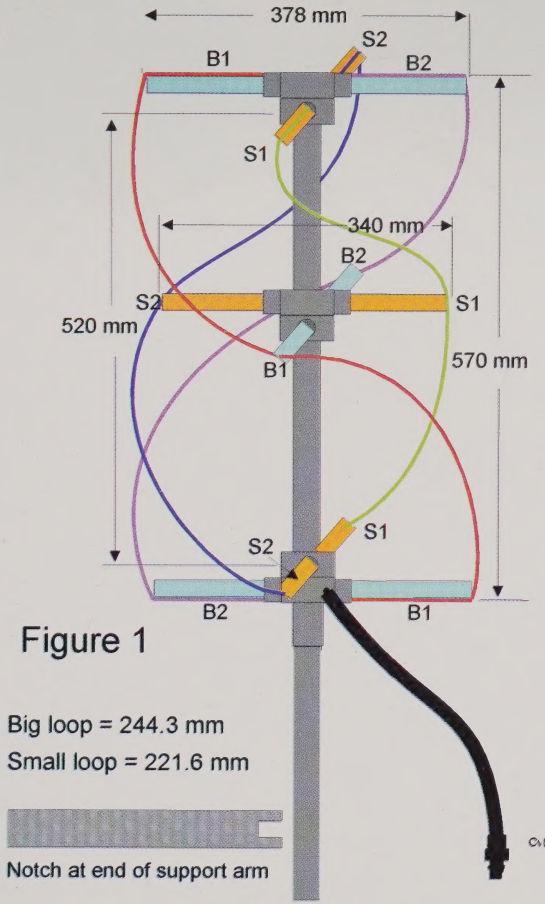


Figure 1

Big loop = 244.3 mm

Small loop = 221.6 mm

Notch at end of support arm

CvL Jan '96

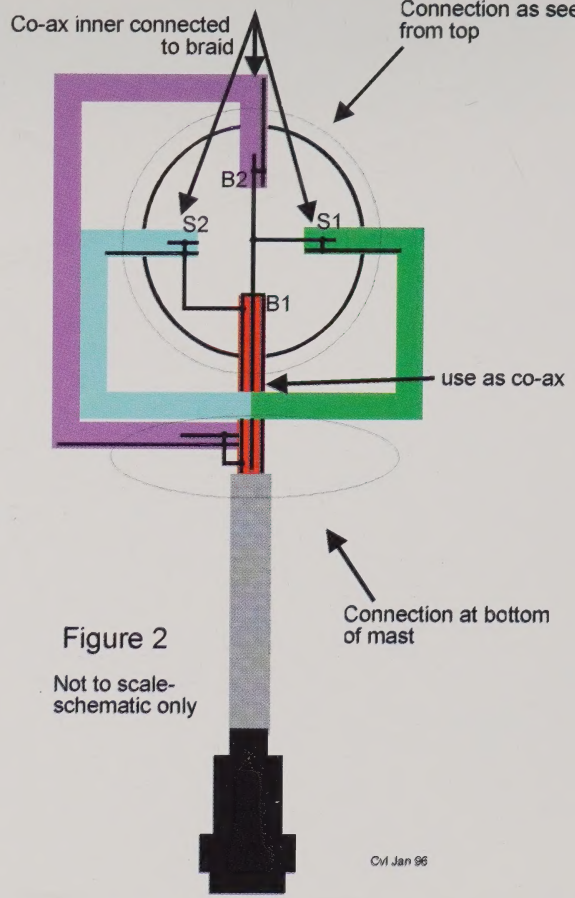


Figure 2

Not to scale-schematic only

CvI Jan 96

Hubble Deep Field Details · HST · WFPC2

PRC96-01b · ST ScI OPO · January 15, 1995 · R. Williams (ST ScI), NASA